Symposium OPEN IVR
Speech Recognition Option Guide

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About this guide

The S*ymposium OPEN IVR Speech Recognition Option Guide* is your guide to developing and running Symposium OPEN IVR applications that use Nortel's (Northern Telecom's) Automatic Speech Recognition (ASR) option.

This guide explains the basics of ASR. It covers the generalities of installation and configuration of the hardware and software resources, and of working with the building blocks (Symposium OPEN IVR cells) that you will use to develop ASR applications.

Audience

This guide has been written for site administrators and trained service personnel who install and configure Automatic Speech Recognition resources at their site. It is also intended for application developers who will build and run speech recognition applications.

Related documents

Additional information about Symposium OPEN IVR 4.0 is presented in the following Release 4.0 documentation:

Document	**NT number/ A0 number/ P0 number**
Symposium OPEN IVR 4.0 Getting Started Guide	NTVE8201 A0732100 P0881271
Symposium OPEN IVR 4.0 Product Guide	NTVE8202 A0732101 P0881273

Symposium OPEN IVR 4.0 System Administration Guide	NTVE8203 A0732102 P0881274
Symposium OPEN IVR 4.0 Application Development Guide	NTVE8209 A0732108 P0881275
Symposium OPEN IVR 4.0 Cell Catalog	NTVE8208 A0732107 P0881276
Symposium OPEN IVR 4.0 Installation, Upgrade, and Maintenance Guide	NTVE8204 A0732103 P0881277
Symposium OPEN IVR Planning and Engineering Guide	NTVE8205 A0732104 P0881278
Symposium OPEN IVR 4.0 Error Messages Guide	NTVE8206 A0732105 P0881279
Symposium OPEN IVR 4.0 Web Option Guide	NTVE8210 A0732109 P0881281
Symposium OPEN IVR 4.0 SQL Server User Guide	NTVE8216 A0732115 P0881282
Symposium OPEN IVR 4.0 Service Console Interface Reference Manual	NTVE8207 A0732106 P0881284
Symposium OPEN IVR 4.0 VT100 Host Connectivity Configuration and Development Guide	NTVE8221 A0732120 P0881286
Symposium OPEN IVR 4.0 Text-to-Speech Option Guide	NTVE8213 A0732112 P0881292
Symposium OPEN IVR 4.0 Speech Recognition Option Guide	NTVE8212 A0732111 P0881293

Symposium OPEN IVR 4.0 Fax Option Guide	NTVE8211 A0732110 P0881294
Symposium OPEN IVR 4.0 CAS and ISDN Signaling Option Guide	NTVE8214 A0732113 P0881296
Symposium OPEN IVR 4.0 Integration Package for Meridian Link User Guide	P0881297 NTVE8215 A0732114
Symposium OPEN IVR 4.0 Prompt Import Utility Guide	NTVE8218 A0732117 P0881400
Symposium OPEN IVR 4.0 SNA Host Communications Guide	NTVE8227 A0732774 P0881750

How to use this guide

This guide is organized as follows:

- Chapter 1, "Introduction to ASR", describes the basic concepts behind Automatic Speech Recognition and how voice applications interact with recognizer resources.
- Chapter 2, "PureSpeech/Antares overview", presents an overview of the PureSpeech option features, along with the system requirements needed to run it.
- Chapter 3, "PureSpeech installation", details the procedures which install the PureSpeech option.
- Chapter 4, "VCS/Antares overview", presents an overview of the VCS/Antares features, along with the system requirements needed to run the option.
- Chapter 5, "VCS/Antares installation", details the procedures which install the VCS/Antares option.
- Chapter 6, "VCS (VR/160) overview", presents the system requirements for the VCS (VR/160) ASR option.
- Chapter 7, "VCS (VR/160) installation", details the procedures which install the VCS (VR/160) option.
- Chapter 8, "Speech recognition files", presents an overview of the files you will need to perform speech recognition.
- Chapter 9, "Managing ASR resources", discusses the various components you need to implement an ASR configuration, from recognizers to prompts.
- Chapter 10, "Building ASR applications", discusses the OPEN IVR cells you will use to develop ASR applications, and includes a sample speech recognition application.
- Chapter 11, "Troubleshooting", provides useful information for solving common ASR application problems.
- Appendix A, "Board configuration", shows the layout and various configuration requirements of the Antares and VR/160 boards.
- Appendix B, "Sample application: Voice-Activated Dialing", briefly presents a practical application of ASR resources.

Conventions used in this guide

Throughout this guide, several typographic conventions have been used to highlight certain types of information:

- Items that appear on the Symposium OPEN IVR screens are identified in quotes, for example:

  the “Timeout” part of the parameters window

- Prompts, File and Menu names, Directories, Accounts, and Options are shown in a different typeface, for example:

  `/sci>`

  `sci/install` menu

  `/u/nortel/3270/getbalance.act` file

- Symposium OPEN IVR buffer names are shown in all uppercase characters, for example:

  the CURRENT MESSAGE buffer

- Field names are shown in italics, for example:

  the *Device* field

- Items you must type are shown in bold in a different typeface, for example:

  type **`tn5250`** at the prompt

- Variables shown in command lines appear in italics, for example:

  the `host_cfg`*n* file, where *n* is a variable representing a board number

- Key names you press are shown in angled brackets, for example:

  the <F1> key

- Keyboards usually have keys named <Return> or <Enter> that perform the same function. For convenience, this guide uses the keyname <Enter> to represent both keynames.

Chapter 1: Introduction to ASR

The Automatic Speech Recognition (ASR) option provides a natural interface between callers and your Interactive Voice Response (IVR) applications. In the past, ASR was used primarily as a substitute for DTMF-based networks. A caller could respond to prompts by speaking instead of pressing touch-tone keys on a telephone keypad. This was particularly useful for calling areas where DTMF was not available, and for callers who did not have DTMF phones.

Today, ASR is opening the door to more sophisticated applications, using large-scale, grammar-based vocabularies in which the interface can recognize human speech beyond the previous 16-word limit of DTMF. This chapter introduces you to ASR, and particularly to how it can be implemented using Symposium OPEN IVR ASR options. It discusses the following:

- What is ASR?
- What are the key components?
- What is a vocabulary?
- ASR features
- Shared resources
- Recognizing speech

What is ASR?

Automatic Speech Recognition is a method for collecting and analyzing human voice data, and then reporting the results of that analysis to identify the contents of the speech. For your IVR applications, this means that you can use speech content as data input for making call flow decisions.

In its simplest applications, ASR provides an alternative to DTMF input. Although you may have previous experience responding to IVR applications by pressing keys on a DTMF pad, some callers may not be able to do so because the touch-tone service is unavailable in their calling area or they do not have a phone equipped with DTMF tones. In either case, speech recognition allows callers the same access to IVR applications as DTMF users.

More significantly, ASR permits callers to respond more naturally, speaking as they would to a “live” person at the end of the phone line.

This feature is becoming a necessity as ASR is implemented in more sophisticated applications, such as stock quotation systems, home banking, small directory inquiry systems, postal code systems, help desk systems, and collect call automation.

What are the key components?

The key components of automatic speech recognition are the application, the recognizer, and the vocabulary.

The application controls the interface to the caller and other resources, such as prompts and speech-recognition resources.

The hardware and software necessary to interpret a caller’s speech comprise the recognizer. Each recognizer is allocated, de-allocated, and configured as necessary to analyze caller speech input.

The vocabulary defines a domain of words, phrases, or grammatical constructs common to the expected caller’s speech. A recognizer uses this vocabulary to analyze a caller’s utterance and then select the best result to be returned to the application. The result includes a string that identifies the content of the analyzed voice input. The application then associates a context to the result to perform a specific action.

For example, the application prompts the caller for a response. The action that the application will take depends on how the recognizer interprets the caller’s response. The recognizer compares the caller’s speech with the contents of the vocabulary.

What is a vocabulary?

Speech recognition can only occur if both the caller and the ASR resources speak the same language. The language of ASR is based on the available vocabulary.

A vocabulary consists of one or more binary files that contain recorded representations of words and speaker utterances. These representations are called “templates.”

Early vocabularies were word-based, consisting simply of a list of words. For example, a word-based vocabulary could consist of digits zero through nine and the words “yes,” “no,” and “oh.” Today’s ASR technologies use large-scale vocabularies built on grammatical structures. By defining optional phrases and multiple sentence structures for each vocabulary entry, speech can be input in a more natural fashion. The speech input is analyzed using either pattern-matching or phoneme-based algorithms to identify the spoken word or phrase.

Small versus large vocabularies

Small vocabularies consist of up to 16 words, corresponding to the possible telephone keypad entries. Most of these words are restricted by what can be mapped to the DTMF telephone keypad. These vocabularies have been useful for DTMF replacement in IVR applications. However, the more sophisticated applications require a broader use of speech.

Large scale vocabularies can accommodate the additional words required to support such applications as automated attendant, voice activated dialing, flight reservation systems, directory assistance, and automatic mutual fund quotations.

Language and vocabularies

A vocabulary is the *domain* of all of the words or utterances that your ASR technology will use to attempt to recognize caller speech. Each vocabulary is associated with a specific language (or groups of languages), that corresponds to the expected language of the caller. Examples include North American English, French, and German.

Each vocabulary may contain one or more subvocabularies. For example, consider the North American English vocabulary from VCS (a small vocabulary). It contains the digits and “yes/no” subvocabularies. Each of these subvocabularies contains a list of words to be recognized.

Some vocabularies include words from more than one language. For example, the North American Multilingual English/Spanish vocabulary includes these subvocabularies: “English digits,” “Spanish digits,” “English yes/no,” “Spanish yes/no,” and “Bilingual yes.” Consequently, as you develop your IVR applications, imagine that the vocabulary to be used at any given time in the call flow actually consists of a language component as well as a subvocabulary.

Your application could activate a specific language and any one of the associated subvocabularies for use by your call flow. Once activated, the application expects the caller to respond with an utterance contained in that subvocabulary.

Grammar-based vocabularies

Grammar-based vocabularies are more common today. They can store more information than small, word-based vocabularies. They include the various morphemes associated with a language. The caller can speak in complete phrases or sentences rather than responding with single words.

By defining optional phrases and multiple sentence structures for each vocabulary entry, these newer technologies allow speech to be input more naturally. In addition, various aspects of the vocabulary may contain tags, labels, or returned text that assist applications in determining the language content of an utterance.

ASR features

ASR is an ever-changing technology with a variety of features from which you can choose to build and run applications. These include the following:

- discrete and continuous recognition
- speaker dependent and independent
- voice cut-thru (or barge-in)
- grammar/phrase spotting

Discrete and continuous recognition

Automatic speech recognition utilizes two basic types of speech technologies: *discrete* and *continuous* speech.

Discrete speech recognition identifies words spoken between beeps that frame each word. A beep preceding the caller's speech is sufficient to identify the start of the incoming speech.

> ***Note:*** If the beep is turned off the recognizer has no boundary information, and can only do single digit recognition.

With continuous speech recognition, word pacing is not as stringent. Speech can be recognized with less than 50 msec of silence separating words.

Table 1-1 compares the two speech technologies.

Table 1-1: Discrete versus continuous speech recognition

Feature	Discrete	Continuous
Silence requirements	High (250 msec)	Low (less than 50 msec)
Intensive data comparison (cost)	Low	High
Flexibility for variety of applications	Low	High
Recognition response time	High	Low

Speaker dependent and independent

A speech recognition vocabulary can be either speaker-*dependent* or speaker-*independent*. The difference between these two technologies is that speaker-dependence recognizes a specific caller's voice, whereas speaker-independence recognizes speech, regardless of the caller.

A speaker-dependent recognizer identifies spoken input after it has been trained to detect and recognize specific voices. A speaker-independent recognizer identifies spoken input without users having to train it.

Speaker-dependent recognition generates predictable results based on a user's unique way of pronouncing certain words or phrases for which the system was previously trained by that particular user, whereas speaker-independent recognition generates the same result for the same word independent of the user. Table 1-2 lists the differences between speaker-dependent and speaker-independent recognition.

> ***Note:*** Speaker-dependent speech recognition, where available, is available only in discrete mode. Also, speaker-dependent speech recognition cannot be used for security purposes. Voice patterns can be similar and still work.

Table 1-2: Speaker-dependent versus speaker-independent

Feature	Speaker-dependent	Speaker-independent
Training	Required	Not required
Voice specific	Yes	No
Vocabulary flexibility	Easy to change or add words (limited words)	Limited to available word list
Users recognized	Restricted to voice-matched users*	No restriction
Environmental accuracy	Depends on quality of training	Designed for demanding environmental conditions
Speaker characteristics	Selective recognition to only voice-matched users	High accuracy regardless of such attributes as dialect and gender
System memory requirements	Uses additional memory for each user	Minimized by using a single set of templates

Voice cut-thru

Voice cut-thru, also referred to as barge-in, allows a caller to speak while a prompt is playing. The prompt is interrupted and is discontinued, as the recognizer retrieves the speech input and attempts to match it against the vocabulary domain.

This feature is useful because it emulates natural speech interaction. This is similar in DTMF-based applications to callers interrupting prompts by pressing DTMF tones on the keypad.

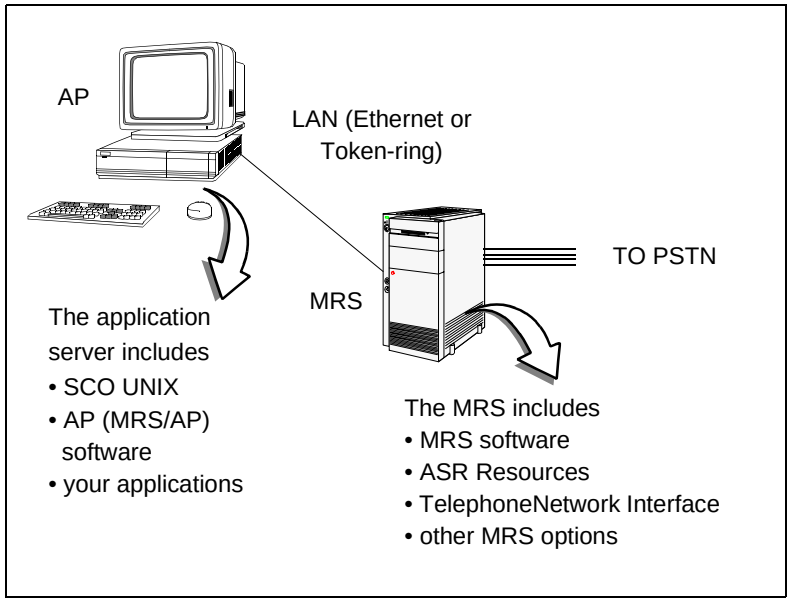
Grammar/phrase spotting

Grammar/phrase spotting allows the caller to speak in complete phrases and sentences, and then isolates and returns the word/phrase included in the vocabulary file. For example, if the vocabulary were a list of major U.S. cities together with their state, and the caller said, “Uum, er, I want to go to Boston, Massachusetts tomorrow,” the recognizer would isolate and return only the phrase “Boston, Massachusetts.”

Shared resources

ASR resources are typically installed in your MRS so that they can be allocated to ASR applications running on your application server. In folded configurations, the MRS and application server are located in the same machine (for example, MRS/AP system). Figure 1-1 illustrates a distributed environment in which hardware-based ASR resources are installed on an MRS separate from the AP.

Figure 1-1: Hardware-based ASR, MRS relation to PSTN



On the MRS, ASR is a time-shared resource, meaning that it can be shared across all available channels.

> ***Note:*** In a PEB environment, ASR resources are available to all channels on the same PEB.

Recognizing speech

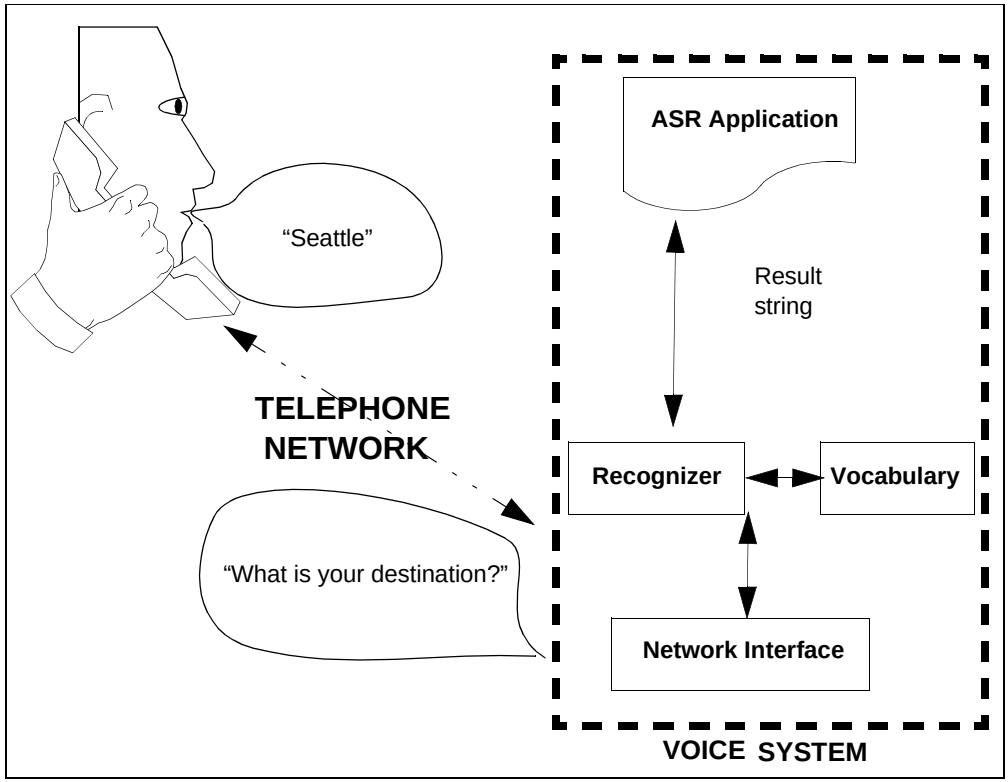
Symposium OPEN IVR ASR utilizes a design in which the lower-level phases of the recognition algorithm are performed by the recognizer. The recognizer may be firmware running on a hardware module laden with Digital Signal Processors (DSP), or software resources.

The higher-level phase (word and phrase matching) is performed by dynamically retrieving the vocabulary, whether word- or grammar-based, from disk on the MRS.

The recognizer's basic functionality is to analyze the caller speech and attempt to match the speech with an entry in the available vocabulary. The vocabulary files may reside on the MRS or on another host on the LAN, depending on the technology you are using.

A typical call interacts with a system equipped with speech-recognition resources as shown in Figure 1-2.

Figure 1-2: Caller-application interaction



1 The voice system answers the call, and the application associated with that channel plays prompts to the caller.

2 Data or speech input from the caller is processed for analog to digital (A/D) conversion.

3 The digitized information is passed to the bus, which transfers these signals to an available speech recognizer. The recognizer compares the detected signal with the application-selected vocabulary. The result from the attempted recognition is passed to the application running on the application server.

4 The application processes the result and takes the action prescribed by the call flow.

As you can probably imagine, there are numerous applications that can benefit from being able to retrieve and interpret caller speech. ASR technology offers this advantage. The remainder of this guide presents an introduction to the resources you will need to develop ASR-based applications.

Chapter 2: PureSpeech/Antares overview

The PureSpeech ASR option adds automatic speech recognition functionality to the MRS/AP, MRS/Tower, and MRS/Rack systems.

The Antares board provides a platform for computer telephony features that require DSP algorithms, such as text-to-speech and speech recognition. The Antares board is a general-purpose DSP module containing four Texas Instruments 32-bit floating-point DSPs, running at a clock speed of 50 Mhz.

> ***Note:*** The PureSpeech ASR option can be installed in either SCbus (Signal Computing Bus) or PEB (PCM Expansion Bus) environment. However, be aware that the installation requirements are different as noted in Chapter 3, "PureSpeech installation".

This chapter covers the following topic areas:

- system requirements
- a brief description of the PureSpeech ASR option features
- a description of the PureSpeech documentation included with this package

The installation procedure for CD-ROM is presented in the following chapter.

Both the hardware module configuration settings and information about the Service Console Interface (SCI) are discussed in the appendixes.

> ***Note:*** You must create your own vocabulary. Refer to Chapter 8, "Speech recognition files" for further information.

System requirements

Before installing the PureSpeech ASR option for MRS software 4.0, make sure that your system has the following in place:

- a SCbus or PEB system configuration

  Note: The installation will differ depending on your system's bus environment.

- an MRS/AP or Pentium-based MRS
- a license file supporting ASR functionality on an AP, PureSpeech on an MRS, and both ASR and PureSpeech on an MRS/AP.

PureSpeech ASR features

The integration of the PureSpeech ASR option with OPEN IVR enables callers to use speech input at any given prompt from a speech-enabled application. Based on the Antares 2000 module, the PureSpeech ASR option offers Symposium OPEN IVR application developers speaker-independent, continuous, large-vocabulary, automatic speech-recognition technology.

The advantage to PureSpeech ASR is that callers are no longer burdened by limited vocabularies, awkward pauses, or cumbersome training periods. PureSpeech ASR allows callers to speak naturally.

PureSpeech ASR combines Hidden Markov Models, Artificial Intelligence, Neural Networks, and Segmental Models to create an efficient, accurate recognition system. Developers and system integrators can quickly produce flexible spoken language systems by taking advantage of PureSpeech ASR capabilities.

PureSpeech ASR technology currently supports the following features:

Note: Multiple languages can be installed in a system (one language on each board).

- multiple-language speech recognition
- recognition on multiple voice channels simultaneously
- automatic real-time adaptation to line conditions at the beginning of each recognition
- dynamic (for each recognition) allocation of a recognizer to a specified voice channel

- return of the best *n* matches of caller speech in the vocabulary
- echo cancellation
- different vocabulary capacities:
  - 20 000 words for ReCite IQ
  - 2 000 words for ReCite Pro
  - 100 words for ReCite Lite
  - Digits and commands for Recite Continuous Digits
- configuration of multiple vocabularies on the same MRS, with dynamic specification of a vocabulary for the next recognition

  Note: For information on creating vocabularies, refer to the PureSpeech vendor documentation.

- grammar and phrase spotting
- ability to create and modify vocabularies
- ability to create continuous-digit vocabularies
- barge-in or voice-initiated aborts of system prompts
- tags or strings of information associated with specific words
- confidence measurements to help reduce confusion of recognized words or phrases
- tunable recognition algorithm parameters
- real-time storage of caller speech for analysis
- configuration and execution of two recognizers for each Digital Signal Processor (DSP)
- software selection of A-law or mu-law data encoding
- compatibility with SCO 5.0.4 (SCO Enterprise Server)

MRS software automatically selects and assigns available recognizers to channels on the MRS. This functionality allows multiple channels running ASR applications to compete for and share sparse recognizer resources.

The barge-in or voice cut-through feature allows a recognizer to start listening to a voice channel while an audio prompt is being played. If the caller starts speaking over the prompt, the system is automatically notified to abort the prompt play and attempts to recognize the caller's speech.

The grammar and phrase spotting feature enables the caller to speak in more natural, complete phrases or sentences, and allows the recognizer to isolate and return only the spoken word or phrase that is in the currently active vocabulary. For example, if the vocabulary is a list of major U.S. cities together with their state, and the caller said, "Uum, er, I want to go to Boston, Massachusetts tomorrow," the recognizer isolates and returns only the phrase "Boston, Massachusetts."

Grammar spotting is enabled by default for all vocabularies. In general, this functionality is desirable; however, if, for a particular application, callers do not speak extra transitional words, greater recognition accuracy can sometimes occur when grammar spotting is off for that application's vocabularies. You turn off grammar spotting by manually editing a parameter associated with the vocabulary. See the section "Creating a vocabulary" on page 2-9 for further information.

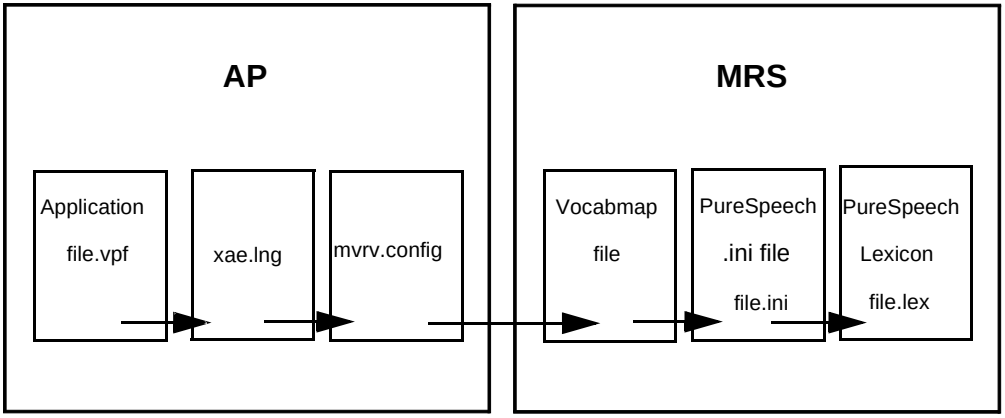
Interaction between the AP and the MRS

The PureSpeech ASR architecture utilizes a unique design in which lower-level phases of the recognition algorithm, including pattern analysis and phoneme matching, are performed on the firmware running on the Antares module. The higher-level phase, word and phrase matching, is performed on the MRS's CPU using vocabulary files that reside on the disk on the MRS.

For your applications running on the Application Processor (AP) to effectively process speech-recognition results, the application processor and the MRS use specific processes and files. On the AP, the `xae.lng` and `mvrv.config` files specify the languages and vocabularies available to applications running on the application processor. Each language or vocabulary is identified by an ID.

On the MRS, the file `vocabmap` maps the language or vocabulary IDs specified in the `xae.lng` and `mvrv.config` files to the PureSpeech ASR vocabularies. These vocabularies are defined by the lexicon file (with the `.lex` file name extension) and the initialization file (with the `.ini` file name extension), which are stored on the MRS. Figure 2-1 illustrates how an application navigates through these files to the lexicon. These files are discussed in further detail in “Creating a vocabulary” on page 2-9.

Figure 2-1: How an application navigates to the PureSpeech Lexicon



Support for Symposium OPEN IVR Developer cells

PureSpeech ASR supports the LANG, VINP, LISTEN, GDAT, and MENU cells in a Symposium OPEN IVR application.

The VINP cell defines the vocabulary used by the PureSpeech ASR recognizer. Refer to Chapter 8, “Speech recognition files”, for more information.

Supported LISTEN cell capabilities

PureSpeech ASR supports the following capabilities of the LISTEN cell:

> ***Note:*** Set the value for the parameter `DTMF Used For` to `DATA`. If the value in the `DTMF Used For` parameter is set to `CONTROL`, the recognizer does not work.

- specification of the speech input `Time-out` (seconds), the `Time-out Prompt` to be played if the `Time-out` expires, and the number of `Time-out Retries` to be attempted
- specification of the set of prompts to be played
- specification of the “Requested Number of Results” (best matches in the vocabulary), return of the same number (at most) of recognition result strings, and return of the “Actual Number of Results” returned
- return of the “Method of Input Detected” (speech or DTMF)
- return of `TOO SOFT`, `TOO LOUD`, `TOO SOON`, or `TOO LONG` speech `Exception Status`
- `SUCCESS`, `REJECTION`, `TIMEOUT`, and `ERROR` exit branches
- return of result text, tags, or both

Time-out value

The `Time-out` value specifies the total number of seconds allotted for recognition of caller speech, starting when the prompt play ends or the caller starts speaking (if he or she barges in during the prompt). Set this value large enough to include the following:

- time for the user's speech input
- time that the recognizer needs to conclude that the caller is finished speaking, and to analyze what the caller said

Although the recognizer determines that the speaker stopped speaking typically in about .5 seconds, the analysis process may require several seconds. Note that you can modify this value by adjusting a parameter in the vocabulary's `.ini` file. Consequently, add two to five seconds to the time allowed for the caller to speak when considering the value for the `Time-out` parameter.

Setting speech zones

Using Time-out value

Although the `Time-out` value specifies the time by which the caller must finish speaking, the LISTEN cell does not currently support a specification of the time at which the caller must start speaking. The PureSpeech ASR technology enables the Application Editor to set the parameter, *`be_speech_timeout_in_seconds`* in a vocabulary's `ini` file which specifies this value for that vocabulary. Note that this specification is statically defined for a given vocabulary; an application cannot specify the same vocabulary in different LISTEN cells and obtain different values for this parameter in each cell.

Using .ini and vocabmap files

You can obtain the same effect by modifying the `.ini` and `vocabmap` files. In this case, make a copy of the `.ini` file for a given lexicon under a new name, and change the parameter *`be_speech_timeout_in_seconds`*. Assign a new MRS vocabulary ID, and update the file `vocabmap` so that the new vocabulary ID points to the new `.ini` file. Note that both the original and the renamed `.ini` files point to the same `lexicon` file. The net result is that the same vocabulary with two different speech start timeout values is now available to the application.

Recognizing strings

The recognition result strings returned by the MRS PureSpeech ASR option contain the text of the word or phrase spoken by the caller, less any out-of-vocabulary words that the recognizer's grammar-spotting feature automatically discards. The result string without the out-of-vocabulary words is the text results format. The PureSpeech text results are always returned in uppercase, and the digit results are always separated by a space (for example, 123 is returned as "one space two space three"). You can write a user function to change the results of these strings.

Tags result format

PureSpeech ASR also supports the `tags` results format. In the grammar definition files (`.phr` and `.bnf` files), you can associate arbitrary strings, or tags, with words. Later, when the recognizer identifies the result words, the tags are returned to the application. This process provides the application designer with an additional method of responding to the parsing of the results.

Dealing with a REJECTION

A `rejection` from a LISTEN cell is possible and needs to be considered in the design of the application. Background noise may be interpreted as unrecognized speech, or the words and phrases in the vocabulary contain phoneme sequences that differ significantly from one another. Any problem with the recognition can result in a rejection.

> ***Note:*** PureSpeech ASR does not currently provide an application programmer or vocabulary builder with control over the confidence level required for a recognition to be considered a match.

Dealing with a TIMEOUT

There are two different events that cause the LISTEN cell to take the TIMEOUT exit branch:

- The `Time-out` specified in the cell expired before the PureSpeech ASR recognizer returned a recognition result to MRS software. In this case, the caller started speaking but then spoke longer than the time allotted by the LISTEN cell.
- The caller did not start speaking within the time limit specified in the `be_speech_timeout_in_seconds` parameter in the `.ini` file for the active vocabulary.

The LISTEN cell cannot distinguish between these two events.

Special operating considerations

Table 2-1 lists the special conditions you need to consider when using the LISTEN cell in conjunction with the PureSpeech ASR option.

Table 2-1: Special conditions for using the LISTEN cell

Cell features	Comment
Unsupported features	The `DTMF Used For` parameter set to control the LISTEN cell is not currently supported.
Barge-in	The barge-in feature is enabled (except during playing of the Time-out prompt). However, the caller must wait approximately one second after the prompt play starts before speaking in order for barge-in to work. This time is used by the recognizer to adjust to the phone line and prompt play characteristics.
Prompt requirements	Specify an audible prompt in the LISTEN cell. The PureSpeech recognizer uses the prompt as a cue to begin recognition. Silence or prompts that are difficult to hear are not adequate to begin recognition. If a prompt is not supplied in the LISTEN cell, the recognizer fails and takes the timeout branch. The caller's speech is ignored by the system.
Rejection	PureSpeech returns its best response based on the vocabulary. You determine the threshold level (refer to your third-party vendor PureSpeech documentation) for which PureSpeech gives a rejection. A rejection is defined as a return with a confidence of 0.

Creating a vocabulary

When using PureSpeech ASR technology, you must compile the textual form of the vocabulary, or phrase list, into a binary form, known as a "lexicon." The lexicon defines the phonetic pronunciation of all of the phrases identified in the phrase list. The tool that creates a lexicon uses a dictionary that defines the phonetic pronunciation of the words in the phrase list.

The PureSpeech ASR vocabulary developer's kit contains a default dictionary of approximately 100 000 commonly used English words. It also provides a set of utilities that enable an application programmer or end-user to build custom vocabularies for a specific application.

Note: Default vocabularies are not provided with the PureSpeech vocabulary developers kit. Consequently, you create custom vocabularies for your applications.

The PureSpeech software developers kit provides support for creating two special small vocabularies, which are optimized to improve recognition accuracy for the following particularly difficult cases:

- Continuous digits, Cancel, Quit, Help
- Yes, No, Cancel, Quit, Help

The .ini file

Each `lexicon` file must be associated with a `.ini` file that specifies values for numerous recognition algorithm parameters to be used when recognition is performed using that lexicon. The `.ini` file also specifies the full path name of the associated `lexicon` file. The `defini` PureSpeech tool creates a default `.ini` file for each `lexicon` file you define. You can install the `.ini` files in any convenient directory on the MRS.

ATTENTION

The path name to the lexicon specified in the defini command is inserted into the .ini file, and later used by the recognition engine at run time. You must specify an absolute path in the .ini file.

.ini parameters

Most of the parameters defined in the file refer to internal-recognition algorithm details and are of no interest to the application programmer. There are a few parameters, however, that an application programmer may want to adjust. These include the following:

- ***be_speech_timeout_in_seconds*** Sets the maximum time the recognizer waits for the caller to start speaking. Refer to the discussion on the LISTEN cell `Time-out` in the section “Support for Symposium OPEN IVR Developer cells” on page 2-6.

- ***be_bargthru_scaling_factor*** Adjusts the sensitivity of the recognizer in detecting caller speech input during a prompt play. Higher values increase sensitivity so that the caller can speak more softly and still be detected over the prompt play, but also increase the likelihood of false speech-start detections (such as the caller coughing or background noise).
- ***viterbi_do_phrase_spotting*** Specifies whether the grammar spotting feature of the recognizer is enabled. By default, this parameter is set to 1 (grammar spotting on); to disable the functionality, set the parameter to 0.

vocabmap file

You need the `vocabmap` file which provides a mechanism for mapping the vocabulary names as specified by the application developer to a vocabulary residing on the MRS. The `vocabmap` file maps the MRS vocabulary IDs used by the LANG and VINP cells to the associated `.ini` and `lexicon` files. You may also want to use the `dtmfmap` file which maps DTMF strings to recognition-result strings.

You can view and edit the `vocabmap` and `dtmfmap` files by using the SCI: from the `/sci/files/vocab/antares` menu, select `listidmap`, `editidmap`, `listdtmfmap`, or `editdtmfmap` for PureSpeech.

Chapter 3: PureSpeech installation

> ***Note:*** Before proceeding with this chapter, make sure that your system meets the requirements described in Chapter 2, "PureSpeech/Antares overview".

These instructions identify the differences between installing the PureSpeech/Antares ASR option in SCbus and PEB environments.

Follow these steps in the order shown to perform the installation. Many of these steps are performed automatically when you install the software from CD-ROM. (If there is an older version of any software, remove it first).

1 Install an Antares Hardware card (unless already installed.)

2 Install the License File on the MRS.

3 Install Option software from CD-ROM or floppy disk.

4 Install the Antares UNIX Development vocabulary developers package.

5 Install the PureSpeech *ReCite!* vocabulary developers kit.

6 Install the PureSpeech ASR Option software.

7 Install the PureSpeech Rules and Description Package.

8 Activate the PureSpeech ASR Option.

9 Test the installation.

10 Build a PureSpeech Vocabulary.

11 Restart the MRS.

Installing an Antares hardware card

Note: Perform this procedure only if you are adding an Antares hardware card to your MRS. The Antares 2000/33 is no longer supported. You must configure a 2000/50 card or better.

General considerations

Before installing the Antares card(s) in your system, address the following configuration considerations:

- When installing the card in a PEB environment, ensure that a PEB terminator is not installed on the Antares card unless the Antares card is installed at the end of the PEB. Refer to Appendix A, "Speech recognition card configuration", for information about the proper location of cards and terminators in a PEB environment.
- When installing the card in an SCbus environment, terminators are not required. Refer to Appendix A, "Speech recognition card configuration", for information about the proper location of cards in an SCbus environment.
- The SW1 switches must be set properly o specify the I/O address of the card. Refer to "How to reconfigure an option" on page 9-7 in Chapter 9, "Managing ASR resources", for further information about suggested hardware configurations.
- Each Antares card must have an updated dongle attached to it. (Dongles are small black devices used by the card to deliver the latest speech recognition technology.)

  Note: If you have a dongle previously used in OPEN IVR 2.01 or OPEN IVR 2.5, *these will not work in SOIVR 4.0*. Such dongles will have to get replaced by new ones.

Installing the Antares card on the MRS

Follow these steps to install the Antares card.

1 Wear an antistatic wrist band when handling the option cards. Unpack the Antares card(s) and remove it(them) from the antistatic bag.

Note: Always observe proper precautions when working with the system. Be sure to follow all Electrostatic Discharge (ESD) guidelines during configuration and installation of the option cards.

2 Shut down the OPEN IVR system. At the UNIX prompt, type **`shutdown -y -g0`** and press <Enter>.

The system takes a few seconds to shut down. At the prompt

```
** Safe to Power off **
        - or -
** Press any key to Reboot **
```

power down the system.

3 Configure the Antares card(s) as shown on the configuration drawing in Appendix A, "Board configuration". You can install the Antares card in any open slot in the system. However, if you need to install the Antares card at the end of a PEB bus, terminate the Antares card with a PEB terminator.

4 Open the MRS and find an open slot where you can install the Antares card(s). Remove the bus cable from any cards that are connected to the Antares card(s).

5 Insert the Antares card(s) into the open slot(s) in your system.

6 If you are installing multiple Antares cards, connect all the cards together using the PEB or SCbus cable supplied with the Antares option. You may need to lift some cards from their slots in order to attach the cable.

7 Seat and align the cards properly before securing the card with the retaining screws.

8 Power up the system and allow it to boot normally.

The License file

The License file is unique to your system configuration. Each time your configuration changes in any way, you have to load a new license file to enable its functionality.

Note: The license file is always generated by Nortel—whether for initial installations or for upgrades.

Before you begin

Before installing licenses, make sure of the following:

- the build process has been completed successfully
- the network (between the APs and MRSs) is functioning properly
- remote commands (for example, `rcp`) work properly

Installing the License file

To install the license file, follow these steps.

1 Insert the license diskette into the floppy drive of the main AP.

This diskette is DOS formatted, and contains any of the following files.

File	Contains	For
w1234500.kcd	KDS (version 2.0) enveloped licensed files	AP1
w1234501.kcd		MRS1
w1234502.kcd		MRS2
w1234503.kcd		MRS3
w1234504.kcd		MRS4
w1234588.kcd		MRS/AP
w1234599.kcd		redundant AP (AP2)

The diskette could also contain raw (unenveloped) versions of license files.

File	Contains	For
w1234500.kcd	raw licensed file	AP1
w1234501.kcd		MRS1
w1234502.kcd		MRS2
w1234503.kcd		MRS3
w1234504.kcd		MRS4
w1234588.kcd		MRS/AP
w1234599.kcd		redundant AP (AP2)

Note: Any files named differently from the above will *not* work.

2 At the UNIX prompt, type the following:

```
install_licenses
```

3 Monitor the progress of the installation.

If the installation of the licenses to an AP or an MRS was successful, the message `Successfully installed license for ...` is displayed.

Note: If there are any problems distributing the files to the different MRSs or APs, the following message is displayed:

```
Unable to copy license file for  ....
```

This indicates a problem with the network connection. Test your network connections with `ping` or `telnet`, and try again.

If there is a problem unwrapping a KDS enveloped license file, the following message is displayed:

```
Unable to extract license file for ....
```

This indicates a likely problem with either the diskette itself or the drive that you are using. Test both of these and then try the installation again.

4 Once the license file is successfully loaded, remove the disk from the disk drive.

5 Restart the OPEN IVR system. The license takes effect upon startup.

Installing the Option software

This section describes how to install the Option software, including the following:

- Antares UNIX Development vocabulary developers kit
- PureSpeech *ReCite!* Package, including PureSpeech *ReCite!* languages

CAUTION

Risk of data loss

If you previously installed the PureSpeech option, this installation will overwrite the existing `vocabmap` file. If you need this file, save it before beginning this installation procedure.

- PureSpeech ASR Option
- PureSpeech Rules and Description Package

Note: New systems are pre-loaded at the factory with ASR software. The software installation procedures discussed in this section are required only for restoring the software, or are to be used in the event that the option is purchased separately after the initial purchase of the base system.

Follow these steps to install the option software

1 Log in to the SCI as **`service`**.

2 At the `/sci` prompt, type **`install`** and press <Enter>.

The SCI displays a warning message:

```
************************************************
WARNING - Executing this option will cause the
system to be stopped.  Once the Install Menu is
entered the only way to restart operations will be
to reboot the MRS.
************************************************
```

```
Are you sure you wish to continue?
Current continue?  = no
yes     - Continue with operation.
no      - Return to previous menu.
continue?  =
```

3 Type **y** and press <Enter> to continue.

4 From the `/sci/install>` prompt, type **`package`** `and press` <Enter>.

The system displays the following options:

```
Select Media Device:
1. CD-ROM
2. Hard Disk          (local installs only)
Please enter your selection or q to quit []:
```

5 Type **1**, indicating the CD-ROM, and press <Enter>.

The system displays the following options:

```
Specify which host machine installing FROM and TO:
-------------------------------------------------
1. FROM   localhost   TO   localhost
2. FROM remote host TO   localhost
3. FROM   localhost   TO remote host
Please enter your selection or q to quit []:
```

Make your selection depending on where the CD-ROM is located. :

If the CD-ROM is on a:	And the ASR resources are on:	Then select:
local server	local server	1
remote server	local server	2
local server	remote server	3

If you have an MRS/AP, select **1.** For unfolded systems which use the remote CD on the AP to install options on the MRS, select **2**. You will see the prompt for the host name of the remote machine.

Note: You should enter the full domain name or IP address if prompted for the remote hostname.

After the host information is gathered, you see the prompt:

```
Enter “c” to continue, “r” to redo, or “q” to quit
```

6 Type **c** and press <Enter> to continue.

The system prompts you to insert the CD into the drive.

7 Insert disk into drive and press <Enter> to continue.

The system displays the following message:

```
Specify which package will be installed:
```

8 Press <Enter> for each option, except MRS for which you type **y** and press <Enter>.

9 To continue, type **c** and press <Enter>. The SCI displays:

```
Select the MRS package to be installed:
```

10 Press <Enter> for all choices, except Speech technologies for which you type **y** and press <Enter>.

The system displays:

```
Installing Dialogic Antares SDK for SCO [n]?
```

11 Type **y** and press <Enter> to continue.

The system displays:

```
Installing ASR[n]?
```

12 Type **y** and press <Enter> to continue.

13 The SCI displays a screen of ASR choices. Type **n** (or press <Enter>) for each prompt except the following, for which you type **y** and press <Enter>.

```
Installing PureSpeech/Antares ASR [n]?
PureSpeech/Antares ASR Option.......[n]?
PureSpeech/Antares ASR SDK..........[n]?
Installing PureSpeech ASR Rules files [n]?
English rules files.............[n]?
Spanish rules files.............[n]?
```

The system displays:

```
Installing TTS [n]?
Fax, E1/PRI, BRI.........[n]?
DPD, Global Call.........[n]?
```

14 For all three prompts, type **n** and press <Enter>.

The system displays:

```
Enter “c” to continue, “r” to redo, or “q” to quit:
```

15 Type **c** and press <Enter> to continue.

The system displays:

```
The MRS software must be shut down before
proceeding.
Enter “y” to continue or “n” to exit installation?
```

16 Type **y** and press <Enter> to continue.

17 The system displays several messages. When prompted, press <Enter> to continue.

18 When the system notifies you that the installation is completed, press <Enter> to configure the Antares hardware driver.

The system then displays available IRQ numbers and prompts you to select an available hardware IRQ setting.

Note: Nortel suggests IRQ 9 for Antares cards on most platforms; use IRQ 12 on the MRS/Tower or MRS/Rack.

19 Type **2** and press <Enter>. (Typing a “2” at this point will internally represent a “9” to the system.) The system prompts you to confirm your selection. Type **2** again and press <Enter>.

Note: At this point, the configuration file is opened by the vi editor. Do not make any changes unless you understand the consequences. Under most circumstances, proceed with the next step.

20 Type **<ESC>:wq** to quit the vi editor**.**

The system displays the following message:

```
The configuration is now assumed to be correct.
Do you wish to continue the installation [yn]?
```

21 Type **y** and press <Enter> to continue.

The system displays this message and prompt:

```
If this installation is part of the installation of
an application on an end user's machine, you will
NOT need to install the library. If you wish to do
development work with the driver then you must
```

```
answer yes to the library installation option.
Do you wish to install the library [yn]?
```

22 Type **n** and press <Enter>.

The system displays:

```
The driver will now be installed.
Configuring ...
Installing ...
In order to install the Dialogic Antares UNIX
Development Package - Version 2.01 Release 2, the
UNIX kernel must be rebuilt.
Do you wish to build a kernel now [yn]?
```

23 Type **y** and press <Enter> to rebuild the kernel.

The system displays:

```
The UNIX Operating System will now be rebuilt.
This will take a few minutes. Please wait.
Root for this system build is /
The UNIX Kernel has been rebuilt.
Do you want this kernel to boot by default? (y/n)
```

24 Type **y** and press <Enter>.

The system displays the following message:

```
Backing up /unix to /unix.old
Installing new /unix
The kernel environment includes device node files
and /etc/inittab. The new kernel may require
changes to /etc/inittab or device nodes.
Do you want the kernel environment rebuilt? (y/n)
```

25 Type **y** and press <Enter>.

The system displays information about linking and installing the kernel and displays several messages about installed files.

26 When the system prompts you to view the release notes, respond appropriately and press <Enter> to continue.

The system displays more informational messages.

27 The system prompts you several times to continue or quit. Press <Enter> each time to continue installing all the software.

When you finish installing the software, the system displays:

```
No other software packages selected.
Install another software package (y/n)?
```

28 Type **n** and press <Enter>.

When the `/sci/install` prompt is displayed, the installation from CD-ROM is completed. Proceed to the section entitled “Activating the PureSpeech ASR Option” on page 3-11.

Activating the PureSpeech ASR Option

When the PureSpeech Antares ASR option components (hardware and software) are installed, activate the option using the `/sci/install/setup` menu as follows. The `setup` menu should be used by trained personnel only, using the `service` account.

1 Access the Service Console Interface, as described in “How to access the Service Console Interface (SCI)” on page 9-8.

2 From the `/sci/install/setup` menu, type **`options`** and press <Enter>.

The system displays the available options (these differ between SCbus and PEB environments):

```
antares - Add or delete Antares generic DSP board
based TTS/ASR
gamma - Add or delete gamma fax board
hark - add or delete HARK software option
hwsetup - Display the current hardware setup
done - Return to the previous menu
cancel - Return to the previous menu without saving
changes.
/sci/install/setup/options>
```

3 Type **`antares`** and press <Enter>.

The system displays a list of the currently installed technology packages, and then displays this prompt:

```
Please Enter the Antares board number to edit =
```

4 Enter the number of the appropriate Antares card, and press <Enter>.

The system displays the following message:

```
Current Antares Board Does Not Exist - Add it? =
cancel
add - Add a new entry.
cancel- Do not add the new entry.
   Antares Board Does Not Exist - Add it? =
```

5 Type **add** and press <Enter> to continue.

The system displays the following message:

```
Current Antares clock = 50
50  - 50MHz Antares board.
33  - 33MHz Antares board.
   Antares clock =
```

6 Type **50** and press <Enter> to continue.

If your system is SCbus-based, skip to step 10.

If you are using a PEB-based system, the SCI prompts you to specify the PEB to which the Antares card is connected:

```
Default Enter PEB Number = 0
        Enter PEB Number =
```

7 Type the corresponding PEB number and press <Enter>.

The system displays the following prompt:

```
Default ANTARES board base I/O address in hex =
0x200
   ANTARES board base I/O address in hex =
```

8 Type the base I/O address in hex and press <Enter>. Enter **0x210** for card 1, or enter **0x218** for card 2.

The SCI displays the following prompt:

```
Current Type of data encoding to use? = mu-law
mu-law      - Default data encoding used in the US.
a-law       - Default data encoding used in Europe.
        Type of data encoding to use? =
```

9 Type **mu-law** for processing data in the United States, **A-law** for processing data in Europe, and then press <Enter> to continue.

If your system is SCbus-based, skip to step 10.

If your system is PEB-based, the system displays the following message:

```
Current Number of timeslots on PEB bus? = 24
24          - 24 timeslots on PEB bus.
32          - 32 timeslots on PEB bus.
        Number of timeslots on PEB bus? =
```

10 Respond appropriately and press <Enter> to continue.

Note: Select `mu-law` encoding and `24` timeslots (for T1 systems) or `A-law` encoding and `32` timeslots (for E1 systems).

The system displays a list of the speech technologies that are installed. From left to right, this list shows the number you type to select the technology, the type of technology, the number of ports supported for each DSP, and the minimum number of DSPs to which you must assign a technology. The display below reflects a sample installation.

Note: Although the PureSpeech upper limit is two ports per DSP (as shown in the example below), it is reduced by one for each setting of utterance recording.

Package	Description	# ports / DSP	DSPs required
01	Centigram English TTS	2	1
02	L&H American English TTS	6	1
03	L&H Dutch TTS	6	1
04	PureSpeech English ASR	2	1
05	VCS US English Continuous ASR	2	1
99	Do not load this DSP		

For each DSP on the Antares card, the SCI prompts you for the speech technology to be loaded from this list.

Note: You see the complete list of technologies only when you specify the first package to be installed on the first DSP. For subsequent DSPs, you see fewer options:

```
The package options for the technology you selected
for the first DSP
99 Do not load this DSP.
```

11 Type the package number followed by <Enter>. If you specify 99, no technology package is installed in the associated DSP.

Note: Only one technology can be installed on a card. For example, PureSpeech ASR cannot be installed on a card with any other ASR or TTS technology.

At least one DSP must be loaded with a language package.

12 The system displays the current status of the “beep before the recognition” prompt as follows:

```
Enter Package Number for DSP #1 4
Current 'beep' prompt? = disable
disable - don't issue beep before start of
recognition.
enable beep - precede start of recognition with a
beep.
'beep' prompt? =
```

13 Press <Enter> to accept the default.

The system then displays information about the status of “barge-in”:

```
Current Barge-in (Voice Cut-through)? = disable
enable barge- Enable barge in.
disable - Do not enable barge in.
Barge-in (Voice Cut-through)? =
```

14 Press <Enter> to accept the default.

The system then displays information about the status of the recognizer allocation duration:

```
Current recognizer allocation duration? =
```

```
recognition
recognition - allocate recognizer for each
recognition.
call - assign recognizer for duration of the call.
recognizer allocation duration? =
```

15 Press <Enter> to accept the default.

The system displays information about the status of recognition statistics recording:

```
Current record recognition statistics? = norecord
record   - record recognition statistics.
norecord - do not record recognition statistics.
record recognition statistics? =
```

16 Press <Enter> to accept the default.

You are prompted to specify the ID range (separated by spaces, commas, or a dash) of the vocabularies that could be passed during recognition commands from Symposium OPEN IVR:

```
Enter vocab ids 0 to 255; separate them with a
space,
a comma, or a dash to indicate a range (x-y).
When complete, press <CR>.
Enter ids:
```

These IDs are assigned to specific DSPs on the Antares card and correspond to entries in the `mvrv.config` file. For more information, refer to “Editing the mvrv.config file” on page 8-7.

17 Enter the appropriate information and press <Enter>.

18 Repeat steps 11 through 16 for DSPs 2 through 4.

You see the following message and prompt:

```
Current Do you wish to save utterance to a file? =
yes - Save utterances to a file.
no - Do not save utterances to a file.
Do you wish to save utterance to a file? =
```

19 Enter the appropriate response and press <Enter>. If you type **y**, the system saves all spoken utterances to a file, called the `utterance` file.

20 The system prompts you to enter the full directory path for the `utterance` file.

```
Enter the directory path where files should be
saved:
```

21 Enter the full directory path for the `utterance` file.

The system checks whether the directory exists; if you do not enter a valid directory pathname, the system responds with this message:

```
Directory does not exist!
```

Note: Either the AP or the MRS can generate a name for the `utterance` file. If the AP includes a filename with the LISTEN cell, the system assigns that name to the `utterance` file. The PNAME cell can only play back an `utterance` file included in the LISTEN cell. If the AP does not specify a filename, MRS assigns one. MRS can assign a unique filename for each utterance, or it can assign the same filename for each utterance on a per-channel basis.

```
Enter the directory path where files should be
saved:
```

22 Enter the appropriate information and press <Enter>.

You see the following message:

```
Current wav file name should be unique? = no
yes         - Use unique name.
no          - Do not use a unique name.
wav file name should be unique? =
```

23 Enter the appropriate information and press <Enter>.

The system displays the following message regarding the number of recognizers on each DSP:

```
Enter the number of recognizers/DSP, current MAX=2
   Number of recognizers/DSP =
```

Note: The default number of recognizers for each DSP is defined by the `Rules` file. You can lower this number by entering a different number at this prompt to reduce the load on the system

24 Enter the appropriate information and press <Enter>.

The system asks which product to install on each DSP:

Note: You need to be licensed for each vocabulary that you are installing.

```
Current purespeech product on DSP 1 = pro
digits-   Recognition of digits only
lite      Recognition of small vocabularies
pro -     Recognition of large vocabularies
iq  -     Recognition of huge vocabularies
purespeech product on DSP 1 =
```

25 Enter the appropriate information and press <Enter>.

26 Repeat steps 24 and 25 for DSPs 2 through 4.

27 When DSP 4 is configured, the system returns you to the `/sci/install/setup/options>` prompt; type **done** and press <Enter>.

28 At the `/sci/install/setup>` prompt, type **done** and press <Enter> to save the new configuration.

The installation and activation of the MRS software 4.0 PureSpeech/Antares ASR option is complete.

Testing the installation

A single-digit `.ini` file, installed on the MRS, allows you to perform a simple test of the hardware/software integration. The `.ini` file contains single digits, which means you perform the hardware test with single-digit recognition.

Test for single-digit recognition by building an application with the IVR Developer Application Editor on the AP. When you build your IVR application, include the VINP cell, which enables speech recognition. Set the VINP cell to detect U.S. English Continuous Digits. The `vocabmap` file on your MRS maps the English Continuous Digits one-to-one with the digits in the `.ini` file. Next, include the GDAT cell to prompt for spoken English digits; the GDAT cell must play at least one prompt.

On the MRS side, configure your Antares card as described in "Activating the PureSpeech ASR Option" on page 3-11. When prompted during this procedure for the vocab IDs that the DSPs support, type **`60`** and press <Enter>. This value matches the ID for U.S. English Continuous Digits in the VINP cell in your application.

Run your application. After you hear the prompt for a single digit (or during the prompt, if you have enabled barge-in), speak a single digit. You can tell if the Antares card with the PureSpeech option recognized the spoken digit using either the SAM tool or by including the PDAT cell after the GDAT cell in your application. If successful, the PDAT cell plays back the digit.

Building a PureSpeech vocabulary

Use the PureSpeech *ReCite!* tools to build a vocabulary. To install the vocabulary on your MRS, you must load the lexicon files, the associated set of `ini` files, and the `vocabmap` file. For more information, refer to "Creating a vocabulary" on page 2-9, and refer to your appropriate third-party vendor documentation.

To make accessing PureSpeech *ReCite!* tools easier, add the following path name to your shell's command search path:

```
/usr/local/purespeech/bin
```

> ***Note:*** This resets the $PATH variable for the duration of the session. When you reboot the MRS, the original value of this variable returns. To change it again follow these steps, or set the variable permanently in your .profile file.

For example, use the following process from ksh.

1. Type **`echo $PATH`** and press <Enter> to print out the current list of search paths.
2. Type **`PATH=$PATH:/usr/local/purespeech/bin`** and press <Enter> to concatenate the path to the PureSpeech bin directory to your current search path.
3. Type **`echo $PATH`** and press <Enter> to display your updated search path.

Restarting the MRS

Restart the MRS for your new installation to take effect. Follow these steps after you have completed the installation and configuration

1. Remove the Installation CD from the CD-ROM drive.
2. At the `/sci/install>` prompt, type **`restart`** and press <Enter>.

   The system verifies the integrity of the newly installed packages and informs you of any inconsistencies.

   The MRS starts to shutdown. The system is automatically rebooted once it reaches the shutdown state.
3. Allow the system to boot up normally, which can take several minutes.

Your new installation takes effect when the system comes up.

Chapter 4: VCS/Antares overview

The VCS/Antares ASR option provides Symposium OPEN IVR with VCS-based automatic speech recognition (ASR) functionality through the use of the Antares board.

The Antares board provides a platform for computer telephony features that require DSP algorithms, such as text-to-speech and speech recognition. The Antares board is a general-purpose DSP module containing four Texas Instruments 32-bit floating-point DSPs, running at clock speeds of either 33 or 50 Mhz.

> ***Note:*** The VCS/Antares ASR option can be installed in either SCbus (Signal Computing Bus) or PEB (PCM Expansion Bus) environment. However, the installation requirements are different as noted in Chapter 5, "VCS/Antares installation".

This chapter presents the following information:

- the main features of the option
- the system requirements necessary to install this option

This chapter documents the prerequisites and procedures necessary for the installation of the VCS/Antares ASR option.

Appendix A, "Board configuration", illustrates the Antares card and describes how to configure it.

Refer to "How to access the Service Console Interface (SCI)" on page 9-8 for information about the Service Console Interface (SCI).

VCS/Antares ASR features

VCS/Antares ASR technology currently supports the following features:

- multiple-language speech recognition

  Note: More than one language can be installed on any system or board.

- recognition on multiple voice channels simultaneously
- automatic real-time adaptation to line conditions at the beginning of each recognition
- dynamic (for each recognition) allocation of a recognizer to a specified voice channel
- return of the best *n* matches of caller speech in the vocabulary
- echo cancellation
- configuration of multiple languages on the same MRS with dynamic specification of a vocabulary for the next recognition
- barge-in or voice-initiated aborts of system prompts
- configuration and execution of two recognizers for each Digital Signal Processor (DSP)
- software selection of A-law or mu-law data encoding

MRS software automatically selects and assigns available recognizers to channels on the MRS. This functionality allows multiple channels running ASR applications to compete for and share sparse recognizer resources.

The barge-in or voice cut-through feature allows a recognizer to start listening to a voice channel while an audio prompt is being played. If the caller starts speaking over the prompt, the system is automatically notified to abort the prompt play, and attempts to recognize the caller's speech.

System requirements

Before installing the VCS/Antares ASR option, make sure that your system has the following:

- a SCbus or PEB system configuration

  Note: The installation will differ depending on your system's bus environment.

- a license file supporting ASR functionality on an AP, VCS on an MRS, and both ASR and VCS on an MRS/AP.

Chapter 5: VCS/Antares installation

Note: Before proceeding with this chapter, make sure that your system meets the requirements described in Chapter 4, "VCS/Antares overview".

These instructions identify the differences between installing the VCS/Antares ASR option in SCbus and PEB environments.

Follow these steps in the order shown to perform the installation. Many of these steps are performed automatically when you install the software from CD-ROM. (If there is an older version of any software, remove it first).

1 Install an Antares Hardware Board (unless already installed).

2 Install the license file on the MRS. The dongle for VCS ASR must be installed.

3 Install the Antares UNIX Development SDK Package.

4 Install the MRS VCS/Antares ASR Option.

5 Install the VCS/Antares Master Installation Package.

6 Install the VCS ASR Vocabularies.

7 Activate the VCS/Antares ASR Option.

8 Restart the system.

Antares hardware board installation

Note: Perform this procedure only if you are adding an Antares hardware board to your MRS.

General considerations

Before installing the Antares board(s) in your system, address the following configuration considerations:

- When installing the card in a PEB environment, ensure that a PEB terminator is not installed on the Antares card unless the Antares card is installed at the end of the PEB. “PEB connectivity examples” on page A-3 show the proper location of cards in a PEB environment and shows the proper location for terminators.
- When installing the card in an SCbus environment, terminators are not required. Figure “SCbus connectivity examples” on page A-7 show the proper location of cards in an SCbus environment.
- The security key (VCS ASR dongle) must be installed on the Antares card. It contains the correct information on the number of ASR channels to be used.
- The SW1 switches must be set properly to specify the I/O address of the card. Refer to Appendix A, “Speech recognition card configuration”, for further information about suggested hardware configurations.
- Each Antares card must have an updated dongle attached to it. (Dongles are small black devices used by the card to deliver the latest speech recognition technology.)

  Note: If you have a dongle previously used in OPEN IVR 2.01 or OPEN IVR 2.5, *these will not work in SOIVR 4.0*. Such dongles will have to get replaced by new ones.

  If an application using VCS/Antares fails in the GDAT, MENU, or LISTEN cell and the following error messages are reported in sci/log:

```
... VCSANTI1 MINOR 4509 API Func Fail: Recog 0: Recognize:
... VCSANTI1 MINOR 4509 API Func Fail: Got my error handler on dev
...VCSANTI1 MINOR 4509 API Func Fail:last error x4c
```

  then the dongle in the Antares card in use is either missing, loosely attached, or malfunctioning.

Installing the Antares hardware card

Follow these steps to install the Antares card

1 Wear an antistatic wrist band when handling the option cards. Unpack the Antares card(s) and remove it (them) from the antistatic bag .

CAUTION

Risk of equipment damage

Always observe proper precautions when working with the system. Be sure to follow all Electrostatic Discharge (ESD) guidelines during configuration and installation of the option boards.

2 Shut down the MRS system. At the UNIX prompt, type **shutdown -y -g0** and press <Enter>.

The system takes a few seconds to shut down. At the prompt

```
** Safe to Power off **
        - or -
** Press any key to Reboot **
```

power down the system.

3 Once the shutdown process is completed, turn off the power to the system.

4 Configure the Antares board(s) as shown on the configuration drawings in Appendix A, “Speech recognition card configuration”. You can install the Antares board in any open slot in the system. However, if you need to install the Antares board at the end of a PEB bus, terminate the Antares board with a PEB terminator. In both cases refer to Appendix A, “Speech recognition card configuration”, for information about the proper location of cards and terminators in a PEB (or SCbus) environment.

5 Open the system and find an open slot where you can install the Antares board(s). Remove the bus cable from any boards that will be connected to the Antares board(s).

6 Insert the Antares board(s) into the open slot(s) in your system.

7 If you are installing multiple Antares boards, connect all the boards together using the PEB or SCbus cable supplied with the Antares option. You may need to lift some boards from their slots in order to attach the cable.

8 Seat and align the boards properly before securing the board with the retaining screws.

9 Power up the system and allow it to boot normally. On the front panel, when the ready light stops flashing, the hardware installation portion of the Antares option is completed.

The License file

The License file is unique to your system configuration. Each time your configuration changes in any way, you have to load a new license file to enable its functionality.

Note: The license file is always generated by Nortel—whether for initial installations or for upgrades.

Before you begin

Before installing licenses, make sure of the following:

- the build process has been completed successfully
- the network (between the APs and MRSs) is functioning properly
- remote commands (for example, `rcp`) work properly

Installing the License file

To install the license file, follow these steps.

1 Insert the license diskette into the floppy drive of the main AP.

This diskette is DOS formatted, and contains any of the following files.

File	Contains	For
w1234500.kcd	KDS (version 2.0) enveloped licensed files	AP1
w1234501.kcd		MRS1
w1234502.kcd		MRS2
w1234503.kcd		MRS3
w1234504.kcd		MRS4
w1234588.kcd		MRS/AP
w1234599.kcd		redundant AP (AP2)

The diskette could also contain raw (unenveloped) versions of license files.

File	Contains	For
w1234500.kcd	raw licensed file	AP1
w1234501.kcd		MRS1
w1234502.kcd		MRS2
w1234503.kcd		MRS3
w1234504.kcd		MRS4
w1234588.kcd		MRS/AP
w1234599.kcd		redundant AP (AP2)

Note: Any files named differently from the above will *not* work.

2 At the UNIX prompt, type the following:

install_licenses

3 Monitor the progress of the installation.

If the installation of the licenses to an AP or an MRS was successful, the message `Successfully installed license for ...` is displayed.

Note: If there are any problems distributing the files to the different MRSs or APs, the following message is displayed:

```
Unable to copy license file for  ....
```

This indicates a problem with the network connection. Test your network connections with `ping` or `telnet`, and try again.

If there is a problem unwrapping a KDS enveloped license file, the following message is displayed:

```
Unable to extract license file for ....
```

This indicates a likely problem with either the diskette itself or the drive that you are using. Test both of these and then try the installation again.

4 Once the license file is successfully loaded, remove the disk from the disk drive.

5 Restart the OPEN IVR system. The license takes effect upon startup.

Installing the Option software from CD-ROM

Note: If previous versions of VCS/Antares ASR software are already installed on your MRS, it is recommended that you remove this software prior to continuing with this installation.

To remove a software package from your MRS, use the SCI `/sci/install/remove` option. See the *Symposium OPEN IVR Service Console Interface Reference Manual* for more information.

Option contents

The VCS/Antares ASR option software installed from CD-ROM includes the following:

- Antares UNIX development package
- MRS 4.0 VCS/Antares ASR option software
- VCS/Antares Master Installation package
- VCS Base package
- VCS ASR Vocabularies

Note: New systems are pre-loaded at the factory with ASR software. The software installation procedures discussed in this section are required only for restoring the software, or are to be used in the event that the option is purchased separately after the initial purchase of the base system.

Option installation procedure

Follow these steps to install the option software from CD-ROM

1 Access the Service Console Interface (SCI), as described in "How to access the Service Console Interface (SCI)" on page 9-8. Log in using the **`service`** account.

2 At the `/sci` prompt, type **`install`** and press <Enter>.

The SCI displays a warning message:

```
************************************************
WARNING - Executing this option will cause the
system to be stopped.  Once the Install Menu is
entered the only way to restart operations will be
to reboot the MRS.
```

```
**************************************************
Are you sure you wish to continue?
Current continue?  = no
yes     - Continue with operation.
no      - Return to previous menu.
        continue?  =
```

3 Type **y** and press <Enter> to continue.

4 From the `/sci/install>` prompt, type **`package`** and press <Enter>.

The system displays the following options:

```
Select Media Device:
1. CD-ROM
2. Hard Disk          (local installs only)

Please enter your selection or q to quit []:
```

5 Type **1**, indicating the CD-ROM, and press <Enter>.

The system displays the following options:

```
Specify which host machine installing FROM and TO:
-------------------------------------------------
1.  FROM localhost   TO localhost
2.  FROM remote host TO localhost
3.  FROM localhost   TO remote host
Please enter your selection or q to quit []:
```

Make your selection depending on where the CD-ROM is located. :

If the CD-ROM is on a:	And the ASR resources are on:	Then select:
local server	local server	1
remote server	local server	2
local server	remote server	3

If you have an MRS/AP, select **`1.`** For unfolded systems which use the remote CD on the AP to install options on the MRS, select **2**. You will see the prompt for the host name of the remote machine.

Note: You should enter the full domain name or IP address if prompted for the remote hostname.

After the host information is gathered, you see the prompt:

```
Enter "c" to continue, "r" to redo, or "q" to quit:
```

6 Type **c** and press <Enter>.

The system prompts you to insert the CD into the drive.

7 Insert the CD into the drive and press <Enter> to continue.

The system displays the following message:

```
Specify which package will be installed:
```

8 Press <Enter> for each option except MRS (for which you type **y** and press <Enter>)**.**

9 To continue, type **c** and press <Enter>. The SCI displays:

```
Select the MRS package to be installed:
```

10 Press <Enter> for all choices, except Speech technologies, for which you type **y** and press <Enter>.

The system displays:

```
Installing Dialogic Antares SDK for SCO [n]?
```

11 Type **y** and press <Enter> to continue.

The system displays:

```
Installing ASR[n]?
```

12 Type **y** and press <Enter>.

13 The SCI displays a screen of ASR choices. Type **n** (or press <Enter>) for each prompt except the following, for which you type **y** and press <Enter>**:**

```
Installing VCS/Antares Option[n]?
VCS/Antares ASR option.[n]?
VCS/Antares Base Package .[n]?
```

For all other speech-related prompts, type n and press <Enter>. The system displays the following prompt:

```
Enter “c” to continue, “r” to redo, or “q” to quit:
```

14 Type **c** and press <Enter> to continue. The system displays a few process messages; follow the directions on the screen.

Disregard any error messages referring to `rm:` and `grep:` that you may see during this portion of the installation; they do not impact system operation.

15 When the system notifies you that the installation is completed, press <Enter> to configure the Antares hardware driver.

The system then displays available IRQ numbers and prompts you to select an available hardware IRQ setting.

Note: Nortel suggests IRQ 9 for Antares cards on most platforms; use IRQ 12 on the Release 2 MRS/Tower or 486 MRS/Rack.

16 Type **12** and press <Enter>. The system prompts you to confirm your selection. Type **12** again and press <Enter>**.**

Note: At this point, the configuration file is opened by the vi editor. Do not make any changes unless you understand the consequences. Under most circumstances you proceed with the next step.

17 Press <ESC> and type **`:wq`** to quit the vi editor**.**

The system displays the following message:

```
The configuration is now assumed to be correct.
Do you wish to continue the installation [yn]?
```

18 Type **y** and press <Enter> to continue.

The system displays the following message:

```
If this installation is part of the installation of
an application on an end user's machine, you will
NOT need to install the library. If you wish to do
development work with the driver then you must
answer yes to the library installation option.
Do you wish to install the library [yn]?
```

19 Type **n** and press <Enter> to continue.

The system displays the following message:

```
The driver will now be installed.
Configuring...
Installing...
In order to install the Dialogic Antares UNIX
Development Package - Version 2.01 Release 2, the
```

```
UNIX kernel must be rebuilt.
Do you wish to build a kernel now [yn]?
```

20 Type **y** and press <Enter> to rebuild the kernel.

The system displays the following message:

```
The UNIX Operating System will now be rebuilt.
This will take a few minutes. Please wait.
Root for this system build is /.
The UNIX Kernel has been rebuilt.
Do you want this kernel to boot by default? (y/n)
```

21 Type **y** and press <Enter> to continue.

The system displays the following message:

```
Backing up /unix to /unix.old
Installing new /unix
The kernel environment includes device node files
and /etc/inittab. The new kernel may require
changes to /etc/inittab or device nodes.
Do you want the kernel environment rebuilt? (y/n)
```

22 Type **y** and press <Enter> to continue.

The system displays information about linking and installing the kernel, and displays several messages about installed files.

23 When the system prompts you to view the release notes, respond appropriately and press <Enter> to continue.

The system displays more informational messages.

24 The system prompts you several times to continue or quit. Press <Enter> each time to continue installing all the software.

Note: The installation continues with the VCS Base Package.

The SCI displays a series of messages about the VCS Master Installation program.

25 When you are directed, press <Enter> to continue. The system prompts:

```
Do you wish to continue the installation? {yn}?
```

26 Type **y** and press <Enter>.

```
Please enter the name of the desired installation
directory. For example: /usr/vcs  installs under
```

```
usr/vcs directory.
```

27 Type **/usr/vocab/vcsant** and press <Enter>.

The system displays information about installing files.

28 When the system prompts you to view the release notes, type **n** and press <Enter> to continue.

The system displays:

```
The VCS Antares VR UNIX Development Package
installation is now complete.
cleaning up...
The installation of the Enhanced VR for Antares
UNIX Development Package is now complete.
```

29 Press <Enter> to continue.

Note: The installation continues installing the VCS ASR vocabularies.

The system displays a few messages; follow the directions on the screen to proceed with the installation.

30 When the system requests the desired installation directory, type **/usr/vocab/vcsant** and press <Enter>.

The SCI displays:

```
Installing vocabulary files
The VCS Antares VR UNIX Development Package
installation is now complete
```

31 Press <Enter> to continue.

When the /sci/install prompt is displayed, the installation from CD-ROM is complete. Proceed to the section titled “Activating the VCS/Antares ASR Option” on page 5-13.

Activating the VCS/Antares ASR Option

When the VCS/Antares ASR option components (hardware and software) are installed, activate the option using the `/sci/install/setup` menu as follows. Access to this menu of utilities is restricted to trained personnel using `service` account privileges.

1 Access the Service Console Interface, as described in "How to access the Service Console Interface (SCI)" on page 9-8.

2 From the `/sci/install/setup` menu, type **`options`** and press <Enter>.

The system displays the available options (these differ between SCbus and PEB environments):

```
antares - Add or delete Antares generic DSP board
based TTS/ASR
gamma - Add or delete gamma fax board
hark - add or delete HARK software option
hwsetup - Display the current hardware setup
done - Return to the previous menu
cancel - Return to the previous menu without saving
changes.
/sci/install/setup/options>
```

3 Type **`antares`** and press <Enter>.

The system displays a list of the currently installed technology packages, and then displays this prompt:

```
Please Enter the Antares board number to edit =
```

4 Enter the number of the appropriate Antares board, and press <Enter>.

The system displays the following message:

```
Current Antares Board Does Not Exist - Add it? =
cancel
add       - Add a new entry.
cancel    - Do not add the new entry.
Antares Board Does Not Exist - Add it? =
```

5 Type **`add`** and press <Enter> to continue.

The system displays the following message:

```
Current Antares clock = 50
50          - 50MHz Antares board.
```

```
33          - 33MHz Antares board.
Antares clock =
```

6 Enter the processor speed of your Antares board and press <Enter> to continue.

If your system is SCbus-based, skip to step 7.

If you are using a PEB-based system, the SCI prompts you to specify the PEB to which the Antares card is connected:

```
Default Enter PEB Number = 0
Enter PEB Number =
```

7 Type the corresponding PEB number and press <Enter>.

The system displays the following prompt:

```
Default ANTARES board base I/O address in hex =
0x200
   ANTARES board base I/O address in hex =
```

8 Type the base I/O address in hex and press <Enter>. Enter **`0x210`** for board 1 or enter **`0x218`** for board 2.

The SCI displays the following prompt:

```
Current Type of data encoding to use? = mu-law
mu-law  - Default data encoding used in the US.
a-law   - Default data encoding used in Europe.
        Type of data encoding to use? =
```

9 Type **`mu-law`** for processing data in the US, or **`a-law`** for processing data in Europe, and then press <Enter> to continue.

If your system is SCbus-based, skip to step 10.

If your system is PEB-based, the system displays the following message:

```
Current Number of timeslots on PEB bus? = 24
24          - 24 timeslots on PEB bus.
32          - 32 timeslots on PEB bus.
        Number of timeslots on PEB bus? =
```

10 Respond appropriately and press <Enter> to continue.

Note: Select mu-law encoding and 24 timeslots (for T1 systems), or a-law encoding and 32 timeslots (for E1 systems).

The system displays a list of the speech technologies that are installed. From left to right, this list shows the number you type to select the technology, the type of technology, the number of ports supported for each DSP, and the minimum number of DSPs to which you must assign a technology.

Package	Description	# ports / DSP	DSPs required
01	Centigram English TTS	2	1
02	L&H American English TTS	6	1
03	L&H Dutch TTS	6	1
04	PureSpeech English ASR	2	1
05	VCS US English Continuous ASR	2	1
99	Do not load this DSP		

For each DSP on the Antares card, the SCI prompts you for the speech technology to be loaded from this list.

Note: You see the complete list of technologies only when you specify the first package to be installed on the first DSP. For subsequent DSPs, you see fewer options:

```
The package options for the technology you selected
for the first DSP
99 Do not load this DSP.
```

11 Type the package number followed by <Enter>. If you specify 99, no technology package is installed in the associated DSP.

Note: Only one technology can be installed on a board. For example, VCS cannot be installed on a board with any other ASR or TTS technology.

VCS/Antares does not support any combination of discrete, discrete with cut through, and continuous vocabularies on the same board. Only one type of vocabulary can be installed on each board.

The system displays the current status of the "beep before the recognition" prompt as follows:

```
Enter Package Number for DSP #1 5
Current 'beep' prompt? = disable
disable - don't issue beep before start of
recognition.
enable beep - precede start of recognition with a
beep.
'beep' prompt? =
```

12 Either type **`enable beep`** or press <Enter> to accept the default.

Note: VCS does not support enabling both "beep before the recognition" and "barge in" capabilities simultaneously on the same recognizer. If you enable "beep before the recognition," you will not be asked whether to enable "barge in" (regardless of whether the package supports "barge in").

The system then displays information about the status of "barge-in:"

```
Current Barge-in (Voice Cut-through)? = disable
enable barge- Enable barge in.
disable - Do not enable barge in.
Barge-in (Voice Cut-through)? =
```

13 Either type **`enable barge`** or press <Enter> to accept the default.

The system then displays information about the status of the recognizer allocation duration:

```
Current recognizer allocation duration? =
recognition
recognition - allocate recognizer for each
recognition.
call - assign recognizer for duration of the call.
        recognizer allocation duration? =
```

14 Press <Enter> to accept the default.

The system then displays information about the status of recognition statistics recording:

```
Current record recognition statistics? = norecord
record    - record recognition statistics.
norecord  - do not record recognition statistics.
record recognition statistics? =
```

15 Press <Enter> to accept the default.

You are prompted to specify the ID range (separated by spaces, commas, or a dash) of the vocabularies that could be passed during recognition commands from Symposium OPEN IVR:

```
Enter vocab ids 0 to 255; separate them with a
space,
a comma, or a dash to indicate a range (x-y).
When complete, press <CR>.
Enter ids:
```

These IDs are assigned to specific DSPs on the Antares card and correspond to entries in the `mvrv.config` file. For more information, see “Editing the mvrv.config file” on page 8-7.

16 Enter the appropriate information and press <Enter>.

17 Repeat steps 11 through 16 for DSPs 2 through 4.

Note: Due to VCS licensing restrictions, if you are not fully loading an Antares card, you must configure DSP 4 to contain a package. DSP 4 is the master DSP; if it does not contain a package, you will receive run time licensing errors.

When DSP 4 is configured, the system returns you to the `/sci/install/setup/options>` prompt.

18 Type **done** and press <Enter>.

19 At the `/sci/install/setup>` prompt, type **done** and press <Enter> to save the new configuration.

The installation and activation of the MRS software 4.0 VCS/Antares ASR option is complete. Proceed to the section titled “Restarting the MRS” on page 5-18.

Restarting the MRS

Restart the MRS for your new installation to take effect. Follow these steps

1. Remove the CD from the CD-ROM drive.
2. At the `/sci/install>` prompt, type **`restart`** and press <Enter>.

   The system verifies the integrity of the newly installed packages and informs you of any inconsistencies.

   The MRS starts to shut down. The system is automatically rebooted once it reaches the shutdown state.
3. Allow the system to boot up normally, which can take several minutes.

   When the system comes up, your new installation takes effect.

Chapter 6: VCS (VR/160) overview

This chapter presents the system requirements for the VCS (VR/160) Automatic Speech Recognition (ASR) Option for Symposium OPEN IVR 4.0.

System requirements

Before installing the VR/160 ASR option, make sure that your system has the following:

- a PEB-based system configuration
- a license file supporting ASR functionality on an AP, VR/160 on an MRS, and both ASR and VR/160 on an MRS/AP.

Chapter 7: VCS (VR/160) installation

Note: Before proceeding, verify that the system requirements described in Chapter 6 of this document have been met.

Installation of this option update consists of the following procedures. (If there is an older version of any software, remove it first.)

1 Install a Dialogic VR/160 card. Perform this step only if you are adding a VR/160 card.

2 Install the license file for your MRS supporting ASR functionality.

3 Install the MRS 4.0 VCS (VR/160) ASR option software.

4 Activate the option.

5 Restart the system.

Installing the VR/160 card

Note: Perform this procedure only if you are adding a VR/160 card.

General considerations

Before installing the VR/160 card in your system, address the following configuration considerations:

- This card runs in a PEB environment. Refer to Appendix A, "Speech recognition card configuration", for information about the proper location of cards and terminators in a PEB environment.
- The SW1 switches must be properly set to specify the I/O address of the card. Refer to "How to reconfigure an option" in Chapter 9, "Managing ASR resources' for further information about modifying hardware configurations.

Installation procedure

Follow these steps to install a VR/160 card.

1 Wear an antistatic wrist band when handling the option cards. Unpack the Speech Recognition option card(s) and remove it (them) from the antistatic bag.

Note: Always observe proper precautions when working with the system. Be sure to follow all applicable Electrostatic Discharge (ESD) guidelines during configuration and installation of the option cards.

2 Shut down the IVR system. At the UNIX prompt, type **shutdown -y -g0** and press <Enter>.

The system takes few seconds to shut down. At the prompt

```
** Safe to Power off **
        - or -
** Press any key to Reboot **
```

power down the system.

3 Configure the Speech Recognition option card(s) as shown on the configuration drawings in Appendix A, "Speech recognition card configuration".

Make sure that the card(s) do not have a PEB terminator installed. The Speech Recognition option card(s) should be installed between other cards with the PEB bus terminated only at the ends. However, if the VR/160 card must be installed at the end of the PEB, terminate the VR/160 card.

Note: The VR/160 baseboard can accommodate up to four daughter cards, which can be VRN/2C (continuous) or VRN/40 (discrete). If your MRS system includes two PEBs, install two VR/160 cards—one on each PEB —to share speech-recognition resources across all available channels.

Appendix A, "Speech recognition card configuration", shows the proper location of cards in the Nortel system, and shows the proper location for terminators.

4 Open the MRS and find an open slot where you can install the Speech Recognition option card(s). Follow the recommendations in Step 3.

5 Remove the PEB cable from any cards that will be connected to the Speech Recognition option card(s).

6 Install the Speech Recognition option card(s) in the system. Do not screw the card(s) in yet.

7 Connect all the cards together using the PEB cable supplied with the Speech Recognition option. You may need to lift some cards from their slots to attach the PEB cable.

8 Make sure that the card(s) are properly seated and aligned before installing the card retaining screws. Install and secure the card retaining screws.

9 Power up the system and allow it to boot normally. When the ready light on the front panel stops flashing, the hardware installation of the Speech Recognition option is complete.

The License file

The License file is unique to your system configuration. Each time your configuration changes in any way, you have to load a new license file to enable its functionality.

Note: The license file is always generated by Nortel—whether for initial installations or for upgrades.

Before you begin

Before installing licenses, make sure of the following:

- the build process has been completed successfully
- the network (between the APs and MRSs) is functioning properly
- remote commands (for example, `rcp`) work properly

Installing the License file

To install the license file, follow these steps.

1 Insert the license diskette into the floppy drive of the main AP.

This diskette is DOS formatted, and contains any of the following files.

File	Contains	For
w1234500.kcd	KDS (version 2.0) enveloped licensed files	AP1
w1234501.kcd		MRS1
w1234502.kcd		MRS2
w1234503.kcd		MRS3
w1234504.kcd		MRS4
w1234588.kcd		MRS/AP
w1234599.kcd		redundant AP (AP2)

The diskette could also contain raw (unenveloped) versions of license files.

File	Contains	For
w1234500.kcd	raw licensed file	AP1
w1234501.kcd		MRS1
w1234502.kcd		MRS2
w1234503.kcd		MRS3
w1234504.kcd		MRS4
w1234588.kcd		MRS/AP
w1234599.kcd		redundant AP (AP2)

Note: Any files named differently from the above will *not* work.

2 At the UNIX prompt, type the following:

install_licenses

3 Monitor the progress of the installation.

If the installation of the licenses to an AP or an MRS was successful, the message `Successfully installed license for ...` is displayed.

Note: If there are any problems distributing the files to the different MRSs or APs, the following message is displayed:

```
Unable to copy license file for  ....
```

This indicates a problem with the network connection. Test your network connections with `ping` or `telnet`, and try again.

If there is a problem unwrapping a KDS enveloped license file, the following message is displayed:

```
Unable to extract license file for ....
```

This indicates a likely problem with either the diskette itself or the drive that you are using. Test both of these and then try the installation again.

4 Once the license file is successfully loaded, remove the disk from the disk drive.

5 Restart the OPEN IVR system. The license takes effect upon startup.

Installing the VCS (VR/160) ASR Option software

Note: New systems are pre-loaded at the factory with ASR software. The software installation procedures discussed in this section are required only for restoring the software, or are to be used in the event that the option is purchased separately after the initial purchase of the base system.

To install the option, follow these steps

1 Access the Service Console Interface (SCI) as described on page 9-8.

2 At the `/sci>` prompt, type **`install`** and press <Enter>.

A warning message appears on the screen indicating that if you proceed any further, the currently running process will be shut down. A prompt appears asking if you want to continue.

3 Type **`yes`** and press <Enter> to continue.

The SCI lists the install menu options, then displays the `/sci/install>` prompt.

4 At the `sci/install>` prompt, type **`package`** and press <Enter>.

The system displays the following options:

```
Select Media Device:
1. CD-ROM
2. Hard Disk          (local installs only)
Please enter your selection or q to quit []:
```

5 Select **1**, indicating the CD-ROM, and press <Enter>**.**

The system prompts:

```
Specify which host machine installing FROM and TO
1. FROM  localhost    TO  localhost
2. FROM  remote host  TO  localhost
3. FROM   localhost   TO  remote host
Please enter your selection or q to quit []:
```

Make your selection depending on where the CD-ROM is located. :

If the CD-ROM is on a:	And the ASR resources are on:	Then select:
local server	local server	1
remote server	local server	2
local server	remote server	3

If you have an MRS/AP, select **1.** For unfolded systems which use the remote CD on the AP to install options on the MRS, select **2**. You will see the prompt for the host name of the remote machine.

Note: You should enter the full domain name or IP address if prompted for the remote hostname.

After the host information is gathered, you see the prompt:

```
Enter "c" to continue, "r" to redo, or "q" to quit:
```

6 Type **c** and press <Enter>.

The system displays:

```
Insert installation CD into CD-ROM drive at host =>
localhost. Type q to quit or hit ENTER to continue:
```

7 Press <Enter> to continue.

The system prompts you to select a package: MRS, AP, or License Manager.

8 Type **y** for MRS, **n** for each of the other packages, and then **c** followed by <Enter> to continue. The following prompt is displayed:

```
Select the MRS packages to be installed
```

9 Type **y** for Speech technologies, and **n** for each of the other choices. Then, type **c** and press <Enter> to continue.

The SCI prompts you again with

```
Speech technologies [n]?
```

10 Type **y** and press <Enter>.

11 Type **n** for each prompt except

```
Installing ASR[n]?
```

where you type **y** and press <Enter>.

The system displays the prompt:

```
VR/160 VCS ASR Option for PEB  .  .  [n]
```

12 Type **y** and press <Enter>.

The system displays:

```
Enter “c” to continue, “r” to redo, or “q” to quit:
```

13 Type **c** and press <Enter> .

The message `Install in progress` is displayed on the screen.

Note: If the VCS (VR/160) ASR option is already installed, you will be prompted to press <ESC> to quit, or <Enter> if you want to update the original version of this option. Press <Enter> and continue to the next step.

The installation is complete. You are at the `/sci/install>` prompt. Proceed to the next section

Activating the VCS (VR/160) ASR Option

After the VCS (VR/160) ASR option components (hardware and software) are installed, you must activate the option. This can be done by accessing either the `/sci/install/setup` or `/sci/setup` menu (same menu) as follows. The `setup` menu should be used by trained personnel only, using the `service` account.

1 Access the Service Console Interface as described on page 9-8.

2 From the `/sci/install/setup` menu, type **`options`** and press <Enter>.

The system displays the options menu.

```
/sci/setup>options
antares    - Add or delete Antares generic DSP board
             based TTS/ASR
vr/160     - Add or delete VCS board
brooktrout- Add or delete brooktrout fax board
ptcbrd     - Add or delete PTC board
hark       - add or delete HARK software option
hwsetup    - Display the current hardware setup.
done       - Return to the previous menu.
cancel     - Return to the previous menu without
             saving changes.
```

3 Type **`vr/160`** and press <Enter>.

The SCI displays the prompt:

```
Please Enter the recognizer board number to edit =
```

4 Type the board number (for example, `1`, if this is the first or only board) and press <Enter>.

The following prompt is displayed:

```
Current Recognizer Does Not Exist - Add it? = cancel
add - Add a new entry
cancel- Do not add the new entry
   Recognizer Does Not Exist - Add it? =
```

Note: If the board already has been installed and activated, you will have to cancel and start again, specifying a different board number. Refer to “How to reconfigure an option” on page 9-7 for further information about reconfiguring the option.

5 Type **add** and press <Enter>**.** The SCI displays this prompt:

```
Current VCS Board Type = vr160-1
vr160-1- VCS VR/160 + 1 VRM
vr160-2- VCS VR/160 + 2 VRMs
vr160-3- VCS VR/160 + 3 VRMs
vr160-4- VCS VR/160 + 4 VRMs
   VCS Board Type =
```

6 Type the board type to be activated (this depends on the board configuration; refer to Appendix A, "Speech recognition card configuration") and press <Enter>.

The SCI displays:

```
Please enter VCS recognition type for Module # 1
Current VCS recognition type = 1
1   - VCS VR/160 with discrete VRM
2   - VCS VR/160 with continuous VRM
   VCS recognition type =
```

7 Press <Enter> to accept the default. This prompt is displayed:

```
Enter the vocabulary name without the extension
(dot) part.
Default naengstd:
```

8 Press <Enter> to accept the default.

The SCI prompts you to identify to which PEB cable the card is connected:

```
Default PEB Number = 0
        PEB Number =
```

9 Press <Enter> to accept the default.

The SCI prompts you to identify the encoding method to be used:

```
Current Data encoding = mu-law
mu-law- Default data encoding used in the US
a-law- Default data encoding used in Europe
   Data encoding =
```

10 Type the appropriate encoding method and press <Enter>.

The SCI prompts you to identify the number of timeslots:

```
Current Number of timeslots on PEB bus = 24
24  - 24 timeslots on PEB bus.
32  - 32 timeslots on PEB bus.
    Number of timeslots on PEB bus =
```

Note: Select 24 timeslots for U.S. installations, 32 timeslots for international installations.

11 Type the appropriate timeslot configuration and press <Enter>. This prompt is displayed:

```
Default Recognizer I/O address in hex = 0x200
        Recognizer I/O address in hex =
```

12 Press <Enter> to accept the default. This prompt is displayed:

```
Default Recognizer RAM address in hex = 0xD800
        Recognizer RAM address in hex =
```

13 Press <Enter> to accept the default.

14 At the `/sci/install/setup/options>` prompt, type **done** and press <Enter> to complete activation.

15 At the `/sci/install/setup>` prompt, type **done** and press <Enter> to save the new configuration.

Restart the MRS

To enable this VCS (VR/160) ASR option which you have just installed and activated, you must restart the MRS.

1 At the `/sci/install>` prompt, type **`restart`** and press <Enter>.

The MRS system shuts down and then automatically reboots.

2 Allow the system to boot up normally; it takes several minutes.

When the system comes up again, the option update is installed.

Load the vocabularies

Log on to the system as **root**.

If you are on a folded system (MRS/AP), type **sci.start** and proceed to Step 1 in “Load the language from CD” on page 7-12.

All other systems first have to remotely mount the CD. Type **/maint** then **shell,** then enter these commands:

```
# rcmd <hostname> mount /dev/cd0 /cdrom
# rcmd exportfs -u /
# rcmd <hostname> exportfs -u /
# rcmd <hostname> exportfs /cdrom
# mount <hostname>:/cdrom /mnt
```

Type **exit** to get back to the UNIX prompt, then type **sci.start.**

Checking the settings

During the loading of the language(s) and their vocabularies, it will often be prudent to check on the numbers assigned to the vocabularies before and after you make some entries. These utilities at `/sci/files/vocab/vr160` are available for just such a purpose.

`list`	List installed Vocabularies
`cdload`	Load more Vocabulary Objects from the CD
`load`	Load more Vocabulary Objects from a UNIX-TAR disk
`dosload`	Load more Vocabulary Objects from a DOS disk
`view`	List Vocabulary Objects not yet assigned
`add`	Add a Vocabulary index entry
`edit`	Edit a Vocabulary index entry
`delete`	Delete a Vocabulary index entry
`done`	Return to the previous menu
`cancel`	Return to the previous menu without saving changes

Load the language from CD

Go to `/sci/files/vocab/vr160`.

1 Type **cdload**. The system prompts with:

```
What kind of language?
1. Continuous
2. Discrete
Please enter your selection []:
```

2 Type a number corresponding to your selection. The system responds with a list of vocabularies, as shown in this sample display:

```
1. french
2. german
3. spanish
4. uk_english
5. us_english
6. us_english_cellular
Please select a vocabulary []:
```

3 Type the number of your desired vocabulary, and the system begins to load the appropriate files. The screen display reflects this loading procedure and, upon completion, you are returned to the `../vr160>` prompt.

> **ATTENTION**
>
> Load one language at a time. Load and configure it *completely* before returning to add another one to the language list.

Proceed to the next steps in order to enable and configure the vocabularies corresponding to the language which you have just selected.

Enable and configure the vocabularies

You are at the `/sci/files/vocab/vr160` menu.

4 Type **add**. The system responds with a prompt to select vocabularies, as in this sample display:

```
Choose one of the following Vocabulary ID's to
```

```
load.
Continuous Language Vocabularies for VCS-VR160
  ID.  Description
   8.  French Digits
   9.  French Yes/No
Please enter the vocabulary ID to add:
```

5 Type the number of the selected vocabulary. The system prompts for the type of vocabulary you wish to add.

```
Current Type of vocabulary to add? = discrete
continuous - Continuous vocabulary
discrete   - Discrete vocabulary
Type of vocabulary to add?  =
```

6 Type either **continuous** or **discrete**, as required, and the system adds the vocabulary to the vocabulary list.

7 You have completed loading and configuring a vocabulary. At this point, depending on your needs, you can do one of the following:

If	Then
You want to add another vocabulary for your selected language	Repeat Steps 4 to 7.
You want to select another language	Go to Step 1 and continue until Step 7.

Edit the continuous vocabulary id's

If you are using a continuous vocabulary, you will have to change the number assigned to that vocabulary by the system. In essence, you will add 60 to the currently assigned number. For example, if the current number is 8, you will change that number to 68. Here's how you will do it:

1 At `/sci/files/vocab/vr160`, type **edit**. The system then prompts for the current vocabulary id.

```
Please enter the vocabulary ID for editing:
```

2 Type the number currently assigned to the vocabulary you want to edit. The system then prompts for the vocabulary type:

```
Current Type of vocabulary?  = discrete
continuous - Continuous vocabulary
discrete   - Discrete vocabulary
Type of vocabulary?  =
```

3 Type **`continuous`**. The system responds by again asking for the current number of the vocabulary you are editing:

```
Default Enter the current Vocabulary ID =
```

4 Press <Enter> to accept the currently assigned number displayed by the system as a default. The system then prompts for the new number to be assigned to this vocabulary:

```
Enter the new Vocabulary ID =
```

5 Type a number that is 60 more than the number you had entered in Step 3 above. The system reassigns the vocabulary number and returns you to the `../vr160` menu.

Saving your work

After you have selected and configured your languages, type **done**. This saves the procedures and their assignations.

Chapter 8: Speech recognition files

Before you can use an ASR option, you need to be aware of the how Symposium OPEN IVR applications running on the application server access the various ASR resources. Besides the vocabulary, special ASR files are required. This chapter discusses the following:

- vocabulary files
- other files used by ASR
- setting up ASR files

Vocabulary files

For speech recognition technology to work, a vocabulary of words, phrases, or phonemes must be available on your MRS so that the recognizer resources can interpret caller speech.

Small vocabularies are typically defined by the different vendors (for example, VCS). Large vocabularies are usually constructed by the application developer using special tools from the manufacturer of the ASR technology (for example, the *ReCite!* SDK from PureSpeech).

How the vocabulary is installed and used depends on the vocabulary. However, typically, the following are implemented:

- Vocabulary files are installed on the MRS disks.
- Each subvocabulary is assigned an index or MRS software ID (technology-dependent).
- A subvocabulary is assigned to one or more recognizers (for example, by DSP).
- Each vocabulary description used by applications running on the application server is associated with an AP software ID.

- AP software IDs are mapped to MRS software IDs for retrieval of the physical vocabulary components.

Other files used by ASR processes

Several files are required during initialization of the ASR processes. These are the `vocabmap` file, `dtmfmap.n` files, `devices` file, and `deviceids.n` files. These files all work together to allow very flexible configurations to be implemented. A great deal of the knowledge needed to execute these changes has been placed in a file called the `rules` file. The `rules` file works with another file called the `description` file during configuration.

Table 8-1: Special ASR files

File	Location	Description
vocabmap	MRS	Maps the Symposium OPEN IVR vocab ID to an associated ID or string on the MRS that is vendor-specific. Currently, MRS supports two vendors that use this file: VCS/Antares and PureSpeech. Each one works differently. **PureSpeech** The `vocabmap` maps the Symposium OPEN IVR vocab ID to the `.ini` file generated using the PureSpeech tools (phr2lex, defini, and so on.). The filename must include the full path to where the file exists. This entire string is used in an API call. **VCS/Antares** The `vocabmap` maps the Symposium OPEN IVR vocab ID to the VCS subvocabulary number in the file that is loaded onto the Antares DSP at download. This file contains VCS's mapping of the return digit. Vendor-specific `vocabmap` files are loaded in a vendor-specific directory. These directories are `/usr/vrs/parms/asr/puresp` (PureSpeech) and `/usr/vrs/parms/asr/vcsant` (VCS/Antares). The contents of the `vocabmap` file are vendor-specific and map vocab IDs to a subvocabulary ID (VCS/Antares) or the full path to the specified `.ini` file (PureSpeech).

File	Location	Description
dtmfmap.*n*	MRS	Maps the digit returned from the vendor to the DTMF digit to be passed back to Symposium OPEN IVR. This file exists on a per vocab ID basis and is vendor-specific. These files are created based on each vendor and are loaded in a vendor-specific directory. These directories are `/usr/vrs/parms/asr/puresp` (PureSpeech) and `/usr/vrs/parms/asr/vcsant` (VCS/Antares). The contents of the `vocabmap` file are vendor-specific and map vocab IDs to either a subvocabulary ID (VCS/Antares) or the full path to the specified `.ini` file (PureSpeech).
devices	MRS	This file is generated by the SCI when `done` is entered at either the `/sci/setup` or the `/sci/config` menu. This file contains all the information needed by the ASR process to configure and use each recognizer. The file is composed of 256 lines of data, each line is used by a single recognizer (0–255). The file contains the following information: • Recognizer number • String defining the recognizer (vendor-specific) language • Barge-in enabled/disabled • Continuous/Discrete • Format (Text, Tags, Full, or Index) • Full path to the rules file • Proceed recognition with a beep • Record recognition statistics (TBD) These two files are created by SCI when the user configures the system. There is one *devices* file on the MRS, and it works in conjunction with the `deviceids`*n* files. These files are located in `/usr/vrs/parms/asr`.
Deviceids*n* File	MRS	Lists the recognizers to which a particular process is assigned. These two files are created by SCI when the user configures the system. There is one devices file of the MRS, and it works in conjunction with the `deviceids`*n* files. These files are located in `/usr/vrs/parms/asr`.

File	Location	Description
Description File	MRS	Contains a description of the package it is representing. It is used during system configuration to list which packages are loaded on the system. From the list, the user can configure the hardware (for example, an Antares module) to be loaded with any combination supported by a particular vendor. The description file is always paired with a rules file using `name.des` and `name.rul`. The string is displayed when the command `/sci/config/list` and `/sci/setup/hwsetup`. This file is available either on a Rules and Description disk or may come packaged along with the vendor language files on a repackaged vocabulary disk. The rules and description files are installed on the MRS using the `extracttar` command in `/sci/install` or in the VCS/Antares case, when the language package disk is loaded on by `/sci/install/package`. These files are loaded to these two directories: `/usr/vrs/parms/options/ant_2000` (33 MHz) and `/usr/vrs/parms/options/ant_2000_50`.
Rules file	MRS	This file is loaded onto the system during configuration. The rules file contains the information needed to create the Antares`.cfg` file as well as the devices and `deveids`*n* file. Depending on the vendor, the rules file may exist on a separate disk (also containing the description file), or on a repackaged language disk which may include all information for that vocabulary. The rules and description files are installed on the MRS using the `extracttar` command in `/sci/install` or in the VCS/Antares case, when the language package disk is loaded on by `/sci/install/package`. These files are loaded to these two directories: `/usr/vrs/parms/options/ant_2000` (33 MHz) and `/usr/vrs/parms/options/ant_2000_50`.
mvrv.config	AP	Maps a list of token strings used by the VINP cell to the MRS vocab ID that will be passed to MRS as part of the LISTEN, MENU, or GDAT cell. The vocab ID used in the `mvrv.config` file must be unique.

Setting up the ASR files

Installation of the Antares-based ASR options, such as PureSpeech and L&H, includes loading the associated vocabularies and rules/description files. However, before your ASR applications can perform automatic speech recognition, you must perform additional steps to set up the appropriate configuration:

1. Define the MRS software IDs associated with the loaded vocabularies.
2. Edit the `mvrv.config` file to define AP software vocabulary IDs to be associated with the vocabulary tokens used by AP software.
3. Create a `vocabmap` file to map the AP software vocabulary IDs defined in the `mvrv.config` file with the MRS IDs defined in step 1.
4. Create a `dtmfmap` file to map ASR responses to DTMF digits (to be returned by the GDAT or MENU cell).

   Note: For Antares-based ASR, default `vocabmap` and `dtmfmap` files are supplied.

Assigning vocabulary IDs to specific recognizers

While adding a speech recognition module, you are prompted to specify vocabulary IDs to be assigned to specific DSPs on that board. You can specify any IDs from 0 to 255.

Later, you can modify the vocabulary IDs to be assigned to each DSP. Use the `listids` option to list the current assignments. Then, use the `editids` option to modify the ID assignments. The following example changes the IDs assigned to the DSPs on an Antares board.

```
/sci/files/vocab/antares>  listids
Board #  Board Type            Board Type #
 1       ANTARES BOARD NUMBER   1
Enter the board number for the ids you wish to view 1
        Loaded on DSP1
        VOCAB IDS: 0

        Loaded on DSP2
        VOCAB IDS: 0 1 2

        Loaded on DSP3
        VOCAB IDS: 0 1 2

        Loaded on DSP4
        VOCAB IDS: 0

/sci/files/vocab/antares>   editids
Board #   Board Type           Board Type #
 1        ANTARES BOARD NUMBER  1
Enter the board number for the ids you wish to edit 1
Enter the DSP number whose vocabids you wish to edit 1
Enter vocab ids 0 to 255 separated by a space or <CR>
at the prompt when complete
Enter ids:  0
Continue entering ids or <CR>:
```

Editing the mvrv.config file

The `mvrv.config` file defines AP software vocabulary IDs to be associated with the vocabulary tokens used by IVR developer cells. This file is an ASCII file residing on the application server, and typically is located in the `/u/Nortel/sys_files` directory. You can edit this file with any text editor (like the vi editor).

A portion of a sample `mvrv.config` file follows:

```
GRP_DUTCH          VOC_YESNO        D     5
GRP_ENGLISH        VOC_DIGITS       D     0
GRP_ENGLISH        VOC_YESNO        D     1
GRP_ENGLISH_CON    VOC_DIGITS       C     8
GRP_ENGLISH_CON    VOC_YESNO        C     9
GRP_FRENCH         VOC_DIGITS       D    10
```

The `GRP_*` tokens in the first column define the set of valid Vocabulary Groups; the VOC_* tokens in the second column define the set of valid vocabularies. The letter in the third column defines the type of recognizer resource associated with this vocabulary group/vocabulary pair, where "D" is for discrete or "C" is for continuous. The number in the fourth column defines the vocabulary ID that is sent from AP software to the MRS software in the recognition command.

Editing the vocabmap file

A `vocabmap` file is used to map the AP software vocabulary IDs to MRS software vocabulary IDs. You can view the current vocabmap file by using the `/sci/files/vocab/antares/listidmap` option.

An example follows:

```
/sci/files/vocab/antares>  listidmap purespeech
0 /usr/local/purespeech/test/1digit.ini
```

Use the `/sci/files/vocab/antares/editidmap` option to create a new file. This option opens the current file with the vi editor. `Editidmap` places the user in the editor and allows the user to recreate the file.

Editing the dtmfmap file

A `dtmfmap` file maps VCS responses to DTMF digits to be returned by the GDAT or MENU cell. This file is used on a per vocabulary ID basis. These files can by viewed or replaced by using tools provided by SCI.

Use the `/sci/files/vocab/antares/listdtmfmap` option to view the `dtmfmap` file. A sample follows:

```
/sci/files/vocab/antares>  listdtmfmap
Current Vendor?  = vcs_antares
vcs_antares - Antares DSP board
purespeech  - Purespeech vocabulary map.
hark      - Hark vocabulary map.
lh       - L & H vocabulary map.
        Vendor?  =
Please enter the vocab id number:  1
“0”   1
“1”   2
```

Use `/sci/files/vocab/antares/editdtmfmap` to identify the response string, then the DTMF character to be reformed. This creates a file that will create or overwrite an existing file.

Managing VCS VR/160-based ASR vocabularies

If the VCS VR/160-based ASR option is installed, you can use the SCI to manage the group of words that the MRS will use to process speech. These words are grouped in a vocabulary set. Different vocabulary sets are available for use with different languages around the world.

Each vocabulary set consists of one or more subvocabularies. Because the SCI identifies these subvocabularies as “indexes”, this manual will refer to a subvocabulary as an index.

Each index identifies a specific group of words that the speech recognition resources will attempt to recognize. You can change the vocabulary set that is installed on the MRS, as well as enable or disable each of the indexes. However, the MRS supports only one vocabulary set at a time.

For example, the default vocabulary set is “North American English.” This vocabulary consists of the subvocabularies North American (NA) English Digits and the North American English Yes/No. Each of these indexes is identified by an ID number— in this case, 0 and 1, respectively.

Symposium OPEN IVR and vocabulary sets

If your application call flow enables voice input, the speech recognition resources will attempt to interpret a caller’s verbal response to prompts. The MRS returns a recognition result (such as a word or phrase, depending on the speech technology) to AP software on the application server for further processing.

Managing vocabularies

The `vocab` menu, listed below, includes options that allow you to list assigned indexes, delete an index, load a new vocabulary, assign the loaded indexes, and enable or disable an index.

> ***Note:*** If you load a new vocabulary set, each subvocabulary (that is, index) must be assigned and enabled before it can be used by Symposium OPEN IVR. Also, when you exit the `vocab` menu, any indexes that were loaded but not added are removed from the MRS:

```
/sci/files>  vocab
vr160        - Perform vr/160 vocabulary management functions.
antares      - Perform antares vocabulary management
functions.
done         - Return to the previous menu.
cancel       - Return to the previous menu without saving
changes.
```

Loading a new vocabulary set

ATTENTION

The commands for managing ASR vocabularies differ between technologies. This section illustrates the VR/160-based ASR

You can load a new vocabulary set and all of its indexes either from a UNIX tar disk or a DOS disk by inserting the diskette in the MRS's (MRS/AP's) floppy disk drive and selecting the `load` or `dosload` option, respectively. However, because the MRS supports only one vocabulary set at a time, you should delete all of the installed subvocabularies before loading a new vocabulary set by using the `delete` option.

Initially, after loading a new vocabulary set, all of its indexes are unassigned. The indexes that you intend on using must be assigned with the `add` option before you exit the `vocab` menu; otherwise, they will be removed from the MRS. You can view the unassigned indexes by selecting the `view` option.

An assigned index is stored on the MRS, but is not available for use by Symposium OPEN IVR and the MRS until it has been enabled with the `enable` option. You can list enabled indexes by using the `list` option.

Changing the VCS-VR/160-based vocabulary set

To change the vocabulary set to be used by speech recognition, select the `change` option from the `/sci/files/vocab` menu. You identify the new vocabulary to be used and whether it is discrete or continuous as shown in this example.

```
/sci/files/vocab/vr160>  change
Please enter the recognizer number :  1
  ID DESCRIPTION                    TYPE SIZE NAME
   0 NA English Digits              disc 12   naengstd
   1 NA English Yes/No              disc 5    naengstd
   0 NA English Digits              cont 11   naengstd
   1 NA English Yes/No              cont 2    naengstd
Default Enter the new Vocabulary ID = 0
        Enter the new Vocabulary ID =  1
Current Type of vocabulary?  = discrete
continuous  - Continuous vocabulary.
discrete    - Discrete vocabulary.
        Type of vocabulary?  = c
```

Managing the vocabulary map

Each vocabulary index contains a list of words and the corresponding hexadecimal values that will be returned to Symposium OPEN IVR once the MRS has interpreted a caller's voice input. This list is the vocabulary map. You can view the current map by using the `maplist` option (as follows) and modify the hexadecimal values to be returned to Symposium OPEN IVR by using the `mapedit` option:

```
/sci/files/vocab/vr160>  maplist
Please enter the vocabulary ID for maplist:  0
Current Type of vocabulary?  = discrete
continuous  - Continuous vocabulary.
discrete    - Discrete vocabulary.
        Type of vocabulary?  =
Entry     Result   Text
    0.   0x1 ( 1)  one
    1.   0x2 ( 2)  two
    2.   0x3 ( 3)  three
    3.   0x4 ( 4)  four
    4.   0x5 ( 5)  five
    5.   0x6 ( 6)  six
    6.   0x7 ( 7)  seven
    7.   0x8 ( 8)  eight
    8.   0x9 ( 9)  nine
    9.   0xA (10)  zero
   10.   0xA (10)  oh
   11.   0xF (15)  stop
```

Saving your changes to the vocabulary configuration

If you modify the speech recognition vocabulary configuration, you can either save the new configuration by selecting the `done` option, or exit the `vocab` menu without saving the changes by selecting the `cancel` option.

ASCII characters sent during digit collection

During the digit collection process, the caller either issues a DTMF or MF tone (typically by pressing a key on the phone keypad), or, if the speech recognition option is available, speaks a word presumably in the speech recognition vocabulary. In both cases, the MRS returns a reply consisting of an ASCII character according to the detected word/tone. Table 8-2 lists the relationship between word/tone detected and the ASCII character that is sent in the reply.

Table 8-2: Relationship between word, tone, and ASCII

Word spoken	DTMF digit	MF digit	ASCII character sent
one	1	1	1
two	2	2	2
three	3	3	3
four	4	4	4
five	5	5	5
six	6	6	6
seven	7	7	7
eight	8	8	8
nine	9	9	9
zero or oh	0	0	A
TBD	*	ST	B
TBD	#	ST1	C
yes	A	ST2	D
no	B	ST3	E
TBD	C	FALSE	F
TBD	D	KP	0

Chapter 9: Managing ASR resources

Before you can do anything with Automatic Speech Recognition, you need to know what hardware and software resources are required, and how to install and configure them. This chapter discusses managing the following:

- recognizers
- vocabularies
- prompts

Managing the recognizers

Recognizer resources include hardware, software, and a license file that supports ASR functionality. This section describes the following:

- ASR modules
- option software
- resource activation
- encoding conventions
- license file
- displaying and customizing the configuration

Note: This section briefly discusses setting up ASR resources. Since the available ASR technologies are significantly different, refer to the associated chapter.

Modules

Most ASR configurations consist of one or more recognizer modules installed in the MRS. These resources are shared across available channels. In an SCbus environment, ASR resources are shared across all channels in the MRS. For a PEB environment, ASR module resources are shared across only those channels available on the same bus cable.

Refer to “PEB bus connectivity rules” on page A-1and “PEB connectivity examples” on page A-3 in Appendix A, “Speech recognition card configuration” for termination considerations you need to keep in mind whenever you install an ASR hardware module on a PEB cable.

Option software

The ASR option software must be installed on the MRS and the vocabulary must be loaded. Specific installation instructions for the ASR technology which you will be using can be found in corresponding chapters of this guide.

Resource activation

After the ASR option components (hardware, software, and vocabulary) are installed, the option must be activated. Activation requires admin access privileges to the Service Console Interface on the Symposium OPEN IVR system. Refer to the appropriate ASR option release note for specific installation and activation information.

Once the ASR option has been installed and activated, and your MRS has been rebooted, the option resources are available to your applications.

Encoding conventions

The ASR module uses either the mu-law or A-law PCM encoding. The mu-Law PCM (pulse code modulation) encoding is used throughout North America and Canada, and on all MRSs (MRS/AP’s) with these modules: LSI/120, D/121x, D160SC/LS, and D240SC-T1. and LSI/80.

All European installations use the Aculab E1 card with the D/320SC, the LSI/80 with the D/81A module, or the D/41E-SC line card, and require A-Law encoding. Make sure you select the appropriate coding convention when installing your ASR module.

License file

Whenever you modify any of the options available on an MRS with Symposium OPEN IVR MRS software 4.0 or greater, you need to load a new license file to reflect the various product licenses that you have purchased for your system. Similarly, to use ASR, check that your license file has been updated to support ASR functionality. If this has not been done, contact your service representative.

The `avail` option from the `/sci/admin/license` menu displays information about all of the available licenses for that MRS, as defined by the loaded license file:

```
/sci/admin/license>  avail
lmstat - Copyright (C) 1989-1994 Globetrotter Software, Inc.
Flexible License Manager status on Thu 3/19/98 13:44
Feature                 Version   # licenses    Expires         Vendor
_______                 _______   __________    _______         ______
genAP-odt-runtime       04.004        1        1-jun-1998      vtek
genAP-odt-development   04.004        4        1-jun-1998      vtek
genAP-odt-diskmirror    04.004        1        1-jun-1998      vtek
genAP-odt-nortel-ccip   04.004        1024     1-jun-1998      vtek
genAP-odt-fax           04.004        128      1-jun-1998      vtek
genAP-odt-asr           04.004        64       1-jun-1998      vtek
genAP-odt-tts           04.004        64       1-jun-1998      vtek
genAP-odt-adsi          04.004        1        1-jun-1998      vtek
genAP-odt-promptmanager 04.004        1        1-jun-1998      vtek
genAP-odt-snmp          04.004        1        1-jun-1998      vtek
genAP-odt-cellbuilder   04.004        1        1-jun-1998      vtek
genAP-odt-sqlingres     04.004        1        1-jun-1998      vtek
genAP-odt-sqloracle     04.004        1        1-jun-1998      vtek
genAP-odt-sqlinformix   04.004        1        1-jun-1998      vtek
genAP-odt-sqlsybase     04.004        1        1-jun-1998      vtek
genAP-odt-host3270      04.004        2        1-jun-1998      vtek
genAP-odt-host5250      04.004        1        1-jun-1998      vtek
genAP-odt-hostvt100     04.004        1        1-jun-1998      vtek
genAP-odt-sqlodbc       04.004        1        1-jun-1998      vtek
genAP-odt-web           04.004        1        1-jun-1998      vtek
genAP-odt-ss7           04.004        1        1-jun-1998      vtek
genAP-odt-telephone     04.004        1024     1-jun-1998      vtek
genTSP-odt-runtime      04.004        1        1-jun-1998      vtek
genTSP-odt-volumes      04.004        4        1-jun-1998      vtek
genTSP-odt-tsp          04.004        16       1-jun-1998      vtek
genTSP-odt-telephone-ad 04.004        128      1-jun-1998      vtek
genTSP-odt-telephone-ap 04.004        120      1-jun-1998      vtek
```

```
genTSP-odt-telephone-d  04.004        128       1-jun-1998      vtek
genTSP-odt-telephone-a  04.004        120       1-jun-1998      vtek
genTSP-odt-asr-vct      04.004        64        1-jun-1998      vtek
genTSP-odt-asr-vv       04.004        64        1-jun-1998      vtek
genTSP-odt-dmx          04.004        1         1-jun-1998      vtek
genTSP-odt-diskmirror   04.004        1         1-jun-1998      vtek
genTSP-odt-fax-b        04.004        128       1-jun-1998      vtek
genTSP-odt-fax-bo       04.004        128       1-jun-1998      vtek
genTSP-odt-fax-g        04.004        128       1-jun-1998      vtek
genTSP-odt-snmp         04.004        1         1-jun-1998      vtek
genTSP-odt-tts-c        04.004        64        1-jun-1998      vtek
genTSP-odt-tts-l        04.004        64        1-jun-1998      vtek
genTSP-odt-telephone-dp 04.004        128       1-jun-1998      vtek
genTSP-odt-telephone-ad 04.004        128       1-jun-1998      vtek
genTSP-odt-asr-vdt      04.004        64        1-jun-1998      vtek
genTSP-odt-ups          04.004        1         1-jun-1998      vtek
genTSP-odt-asr-vd       04.004        64        1-jun-1998      vtek
genTSP-odt-asr-pc       04.004        64        1-jun-1998      vtek
genTSP-odt-asr-pi       04.004        64        1-jun-1998      vtek
genTSP-odt-asr-pl       04.004        64        1-jun-1998      vtek
genTSP-odt-asr-pp       04.004        64        1-jun-1998      vtek
/sci/admin/license>
```

As you can see in this example, the license file contains (in bold above) some ASR functionality.

> ***Note:*** If the license manager has not been restarted (`restart` option from this menu) since it was last updated, the information displayed by `avail` may not reflect the current state of the license manager. Whenever loading a new license file, be sure to reset the MRS software using the `reset` option on the `/sci` menu.

Displaying the current ASR configuration

You can display the ASR configuration for your system by selecting the `list` option from the `/sci/config/vrec` menu, as shown in the following example:

```
/sci/config>  list
SYSTEM INFORMATION
    System Bus Type = SCBUS
    Sysgen File Version =  4.00
    Sample Rate = 32k
    Application Processor Link = auto
    A.P. Link Com Port Used = /dev/tty2a
```

```
    A.P. Link Failure Mode = none
    Current COM1 (/dev/tty1a) settings = 9600,7e1
    Current COM2 (/dev/tty2a) settings = 9600,7e1
    Duplicate Error Log Path = /dev/null
    SNMP Service Flag = off
    Default Tail Erase [msec] = 250
    Maximum Record Length [Minutes] = 15
    Minimum Valid Voice [msec] = 250
    Severity Level =

VOLUME INFORMATION
    VOLUME 1    Total Capacity = 14.0MB
    VOLUME 2    Not Formatted or Not Present
    VOLUME 3    Not Formatted or Not Present
    VOLUME 4    Not Formatted or Not Present

TRUNK INFORMATION
    TRUNK GROUP  1  Channels  0 to  3  SCBUS  Loop-B  a-law

RECOGNIZER INFORMATION
    ANTARES BOARD NUMBER = 1
    Clock speed = 50 MHz
    Base IO address  = 0x210
    Data encoding = A_Law
    Number of DSPs configured = 4
    Number of recognizers configured = 4
    DSP  1    PureSpeech English ASR
1 ports
        VOCAB IDS: 0 99

    DSP  2    PureSpeech English ASR
1 ports
        VOCAB IDS: 0 99

    DSP  3    PureSpeech English ASR
1 ports
        VOCAB IDS: 0 99

    DSP  4    PureSpeech English ASR
1 ports
        VOCAB IDS: 0 99
```

In this example, there is one enabled Antares board installed in the MRS. The board is using the A-law encoding algorithm and contains four recognizers loaded with PureSpeech ASR.

Managing the vocabulary

You can load as many vocabularies as you have disk space. However, the maximum number of subvocabularies that can be referenced by your application is 256 (0 to 255). Table 9-1 lists the vocabulary restrictions according to ASR technology.

Table 9-1: Vocabulary restrictions by ASR technology

Technology	Vocabulary capacities	Vocabulary type per board
VCS (VR/160)	1 per board, 1per PEB, 2 per PEB chassis	discrete or continuous but not both
PureSpeech	1 per DSP, 1 per board. The total number of vocabularies equals the number of boards on the system.	continuous
VCS Antares	1 per DSP, 4 per board. The total number of vocabularies is equal to 4x the number of boards on the system.	discrete or continuous

Managing ASR prompts

The prompts you use for speech recognition must be different from DTMF prompts. Rather than use the prompt “Press 1 to reach marketing,” which would be appropriate for callers responding with DTMF tones, you might use the prompt “Say 1 to reach marketing”. Besides using ASR-related prompts, you also want your application to use prompts in the language of your caller.

Predefined system prompts are installed from 0 to 499. Multiple languages are usually supported by enlarging this default set of prompts by 500 for every support language. For example, if your MRS supports English, French, and Spanish, your system would support 1500 prompts. The offset identifies where each prompt group starts.

Table 9-2 illustrates a sample prompt map. It shows how all of the prompts could be mapped on the MRS. Check with your system administrator to determine how prompts are set up.

> ***Note:*** If you need to relocate prompts, use the `mvpmt` tool to copy the prompts to the new location. Refer to the chapter on "Tools" in the *Symposium OPEN IVR System Administration Guide* for more information.

Table 9-2: Multi-language system and application prompt map

Range	Prompts	Offset
0–499	English system prompts	0
500–999	French system prompts	500
1000–1499	Spanish system prompts	1000
1500–1999	English application prompts	1500
2000–2499	French application prompts	2000
2500–2999	Spanish application prompts	2500

How to reconfigure an option

If you wish to reconfigure the settings for an option, you must first delete the current ASR configuration.

Perform these steps

1. Access the Service Console Interface (SCI). Refer to "How to access the Service Console Interface (SCI)" on page 9-8 for more information about accessing the SCI.
2. Access the `/sci/setup/options` menu.
3. Select the `antares` option.
4. When prompted for the board to edit, type the number of the board you want to delete, followed by <Enter>.
5. When prompted to cancel or delete, type **`delete`** followed by <Enter>.

6 Reactivate the ASR option as described for each applicable option:.

For this option:	See this section
PureSpeech Antares	“Activating the PureSpeech ASR Option” on page 3-11
VCS Antares	“Activating the VCS/Antares ASR Option” on page 5-13
VCS (VR/160)	“Activating the VCS (VR/160) ASR Option” on page 7-8

How to access the Service Console Interface (SCI)

You can access the Service Console Interface (SCI) from a dumb terminal, a modem via the RS-232-C, an application processor via the Ethernet, or from an MRS/AP.

Default account passwords

The default account passwords shipped with the system are as follows

Account	Password	Comment
admin	admin1	site administrators on MRS, AP, and MRS./AP
service	service1	service account on MRS
user	user1	routine maintenance on MRS

Using a terminal

To use a terminal to access the SCI, follow these steps

1 Connect a video terminal to the MRS system port B using an appropriate communications cable.

2 Set the terminal parameters as follows:

```
baud rate      2400 or 9600
duplex         Full
data bits      8
stop bits      1
parity         none
add LF         off
```

3 Press <Enter>. The following message is displayed:

```
<system name>
Nortel Service Access Port   Revision 4.00
Copyright 1991-1997, Nortel Corp. All Rights
Reserved
Login:
```

4 At the `login:` prompt, enter the appropriate account name. The passwords for these accounts are listed in “Default account passwords” on page 9-8.

5 After you log in, the system prompts you for your terminal type. If the default terminal type displayed is correct, press <Enter>; otherwise, type in the correct terminal type. (VT100 and ANSI are sample terminal types that can be entered at the TERM> prompt.)

Once this is completed, the SCI main menu is displayed.

Using a modem

Special modem instructions

To allow remote access for support and maintenance, a modem must be attached to your Nortel system. To take advantage of this feature, you must attach the modem between your Nortel system and the telephone network.

Nortel has tested and found the U.S. Robotics Sportster 9600/28.8/33.6 modems compatible. U.S. Robotics 14.4 modems were not compatible and, therefore, not included in this list.

Domestic Customers

Domestic (U.S.) customers receive a modem with the Nortel system.

International Customers

Because of the different telephone network regulations throughout the world, international (non-U.S.) customers do not receive a modem with the Nortel system. Nortel recommends that international customers consult their local telephone service provider to determine an appropriate modem (U.S. Robotics Sportster 9600/28.8/33.6 or its equivalent) for their installation.

To use the modem to access the SCI, follow these steps

1 Connect the modem port on your MRS using a standard MRS-to-modem cable.

2 From the remote location, dial in to the modem and wait for an answer. Once the modem is connected, press <Enter>.

The following message should display:

```
<system name>
Nortel Service Access Port  Revision 4.00
Copyright 1991-1997, Nortel Corp. All Rights
Reserved
login:
```

3 At the `login:` prompt, enter the appropriate account name.

The passwords for these accounts are listed in “Default account passwords” on page 9-8.

4 After you log in, the system prompts you for your terminal type. If the default terminal type displayed is correct, enter a carriage return, otherwise, type in the correct terminal type. (VT100 and ANSI are sample terminal types that can be entered at the TERM> prompt.)

Once this is completed, the SCI main menu is displayed.

Using Ethernet

To use Ethernet to access an MRS, the MRS must be connected to an Ethernet network, and the host that will access the MRS must support TCP/IP and `telnet` (or `rlogin`).

To access the SCI using the Ethernet, follow these steps

1. At the host command line, enter the command: **`telnet 128.1.1.111`**

   If the host is an X Window-based UNIX workstation, Nortel recommends that this command be issued from an xterm window.

   Note: If the Internet address for your MRS system has been changed, enter the correct Internet address instead of the default address shown. This address is noted on your equipment list.

2. Once the session is connected, the following message should display:

   `login:`

3. At the login prompt, enter the appropriate account name.

   The default passwords for these accounts are listed in “Default account passwords” on page 9-8.

4. After you log in, the system prompts you for your terminal type. If the default terminal type displayed is correct, enter a carriage return; otherwise, type in the correct terminal type. (VT100 and ANSI are sample terminal types that can be entered at the TERM> prompt.)

   Once this is completed, the SCI main menu is displayed.

Accessing the SCI from an MRS/AP

The modem method (page 9-9) and the telnet method (page 9-11) can be used to access the SCI from an MRS/AP.

Also, if you have direct access to the console of the MRS/AP system, you can log in and access the SCI by following these steps.

Press the <ALT>, <CNTRL>, and <F1> keys to access the command-line screen.

1 At the `login:` prompt, enter the appropriate account name. The passwords for these accounts are listed in "Default account passwords" on page 9-8.

2 After you log in, the system prompts you for your terminal type. If the default terminal type displayed is correct, press <Enter>; otherwise, type in the correct terminal type.

Note 1: VT100 and ANSI are sample terminal types that may be entered at the TERM> prompt.

Note 2: If you log in as `root`, a # prompt is displayed. At the # prompt, type **`sci.start`** and press <Enter> to access the SCI menu.

Chapter 10: Building ASR applications

To build ASR applications, you need to know what you want to accomplish, and have the tools to do it. Nortel's Symposium OPEN IVR application development system provides the tools—a graphical user interface for developing your ASR applications.

This chapter discusses the following topics:

- preparing for ASR development
- common elements of an ASR call flow
- setting the language
- selecting the appropriate prompts
- activating speech input
- selecting the subvocabulary (mode)
- processing small vocabulary speech
- processing large vocabulary speech
- auditing ASR activity
- sample call flows
- creating a simple application
- testing your ASR application

Preparing for ASR development

Before you jump into developing an ASR application, there are a few things you should verify. These are listed in Table 10-1.

Table 10-1: Preliminary development guidelines

Verify	Comment
Has the ASR option been set up properly?	Without recognizers and the associated firmware, speech recognition cannot occur (refer to “What are the key components?” on page 1-2). Keep in mind that a license file supporting ASR functionality must be loaded on your MRS.
Do the channels that are to be used by your application have access to ASR resources?	For a module-based recognizer, the module should be installed on the same PEB as the network interface whose channels will be used for ASR.
Are you familiar with the available vocabulary?	To view which vocabulary and subvocabularies are installed on the MRS, use the `list all` option from the `/sci/files/vocab` menu. If you require a different language, contact Nortel. Once you receive the vocabulary, load it on the MRS. For large vocabularies that are loaded on a separate host, refer to the manufacturer’s specifications.
Are you familiar with the available prompts?	You can view the word domain of the loaded vocabulary by using the `maplist` option from the `/sci/files/vocab/VR160` menu.

Common elements of an ASR call flow

As you develop your application, keep in mind how Symposium OPEN IVR interacts with the ASR resources in the MRS. Table 10-2 highlights some of the characteristics of which you should be aware.

Table 10-2: Characteristics of using ASR in an application

Element	Description
Speech input	Your call flow must activate speech input, since the default input mode is DTMF.
Language and mode	You will need to identify the language and the mode to be used. The language corresponds to the name of the vocabulary (such as North American English or Swiss Multilingual). The mode corresponds to the subvocabulary.
Ease of recognition	In order to improve the accuracy of the recognizer, design your applications in such a way that they elicit shorter input strings.
Common and unique vocabularies	You can use common vocabularies or a unique vocabulary. Many vocabularies have subvocabularies by the same name, such as *digits* and *yes/no*. The AP software refers to these as *common vocabularies*. A subvocabulary that is not common to other available vocabularies is a unique *vocabulary* (such as *multilingual yes)*.
Changing the subvocabulary	The language/mode you select is tied to the group ID of the subvocabulary on the MRS. This selection remains active until your application makes another selection, or the caller hangs up.
Speech and DTMF input	While speech input is enabled in your VINP cell, callers can respond to prompts in each cell with either speech or DTMF. After this selection, the rest of the input must be in the same style.

Setting the language

To coordinate ASR resources with the callers who will be calling your application, you need to identify the language that will be spoken. Use the LANG cell (shown in Figure 10-1) to set the language.

Figure 10-1: LANG cell

Select one of the languages available to the `language` parameter. The language choices are directly related to the installed vocabularies (such as North American English, Dutch, French, or Spanish).

The language you select remains in effect until another LANG cell in the call flow selects a different language.

Normally, the LANG cell precedes the first VINP cell, which is used to activate speech input. However, if no LANG is used, the language can be set with the VINP cell by specifying a language/mode in the `unique vocabulary` parameter.

Selecting the appropriate prompts

As mentioned in “Managing ASR prompts” on page 9-6, the prompts you use for speech recognition must be different from DTMF prompts. Rather than use the prompt “Press 1 to reach marketing” (which would be appropriate for callers responding with DTMF tones), you might use the prompt “Say 1 to reach marketing.” Besides using ASR-related prompts, you also want your application to use prompts in the language of your caller.

Table 10-3 shows a sample prompt map for the MRS that supports system and application-specific prompts in English, French, and Spanish.

Table 10-3: Multi-language system and application prompt map

Range	Prompts	Offset
0–499	English system prompts	0
500–999	French system prompts	500
1000–1499	Spanish system prompts	1000
1500–1999	English application prompts	1500
2000–2499	French application prompts	2000
2500–2999	Spanish application prompts	2500

If different language prompts are loaded onto the MRS, you select the appropriate prompt group by specifying the prompt offset. Set the offset with the LANG cell:

- Specify the offset of the system prompts in the *system prompts* field.
- Specify the offset of the application prompts in the *application prompts* field.

Activating speech input

By default, AP software applications expect DTMF input from callers. Consequently, your call flow must activate speech recognition.

Use the VINP cell illustrated in Figure 10-2 to turn speech recognition on or off.

Figure 10-2: VINP cell

Once you turn on speech recognition, it remains active until another VINP cell disables speech recognition, or the caller enters DTMF tones.

During the course of your call flow, you may introduce several VINP cells to enable or disable speech recognition.

Selecting the subvocabulary (mode)

To interpret a caller's speech, the ASR recognizers must know which subvocabulary to use. Use the VINP cell to do this.

You have a choice of using common vocabularies or specifying a unique vocabulary. To understand what this means, consider this example of small vocabularies. Suppose that North American English and North American Spanish vocabularies are loaded on the MRS. Table 10-4 lists the subvocabularies associated with these vocabularies.

Table 10-4: Common and unique subvocabularies (sample)

Subvocabularies	Mode
NA English Digits	Digits
NA English Yes/No	Yes/No
NA Spanish Digits	Digits
NA Spanish Yes/No	Yes/No
NA Spanish Bilingual YesNo	Bilingual Yes/No

In the table, Digits and Yes/No subvocabularies are common to the two available vocabularies. They contain the same words but in different languages. However, Bilingual Yes/No is a unique subvocabulary.

Subvocabularies with the same content are assigned the same identifier (for example, DIGITS) to quickly select the appropriate subvocabulary when changing languages. To make these grouped subvocabularies available to your call flow, identify them in the `vocabulary group` parameter of the first LANG cell appearing in your call flow.

Then, whenever you insert a VINP cell, you have a choice to use a common vocabulary or a unique vocabulary.

To use the common vocabulary DIGITS, follow these steps.

1. Set the *use common vocabularies* field to YES.
2. Display the `common vocabulary` parameter, which displays the common vocabularies of those groups identified in a previous LANG cell.
3. Select DIGITS.

If, instead, you do want to use a subvocabulary that is not defined in the LANG cell as a common vocabulary, such as BILINGUAL YES/NO, follow these steps.

1. Set the *use common vocabularies* field to NO.
2. Display the `unique subvocabulary` parameter.
3. Select BILINGUAL YES/NO.

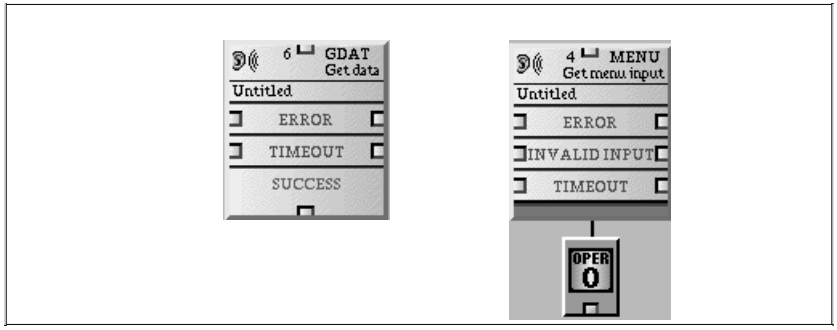
Once you set the subvocabulary, that mode remains in effect until you change it with another VINP cell.

Processing small vocabulary speech

When your application prompts the caller for input, the caller's speech is processed by the ASR recognizer resources. A result is returned to your application.

If you are using a small vocabulary, recognition results are typically handled by either the GDAT or MENU cell (Figure 10-3). The GDAT cell plays a single prompt and retrieves a single result, whereas the MENU cell plays one or more prompts, and retrieves a single result. In either case, the recognizer compares the caller speech to the vocabulary domain, and returns the result.

Figure 10-3: Cells for playing prompts and collecting data



Processing large vocabulary speech

If you are using a large vocabulary, such as a PureSpeech vocabulary, the LISTEN cell (Figure 10-4) is required to retrieve speech input.

Figure 10-4: LISTEN cell

The LISTEN cell can take the SUCCESS or REJECTION branch depending on how successfully the recognizer matches the speech input to the vocabulary domain.

There are a variety of ways that the LISTEN cell can handle the recognition result:

- Evaluate multiple results with associated confidence levels.
- Format returned results.
- Direct rejected responses.
- Report exceptions if the response is too quick, too short, too loud, or too soft.

Evaluating multiple results with associated confidence levels

The LISTEN cell provides the capability to associate a score (as a percentage) with an utterance to determine the probability that the utterance matched a word or phrase in an active subvocabulary. This score is called the Confidence Level.

By coding an ASR application to access the information placed in the `Table of Results` and `Table of Confidences` on the parameter page of the LISTEN cell, and comparing confidence levels of the results (or subset of results), the application can evaluate the utterance. The application can then direct the call flow of the application according to the outcome of the comparison.

Supporting DTMF functionality

There are two modes of DTMF handling: Data and Control. The LISTEN cell contains a parameter called `DTMF Used For,` which sets the mode of DTMF functionality to either Data or Control, as appropriate.

Data mode (which can be either speech or DTMF) directs the application to store a response in a buffer that the application can access when needed. For speech, this response is stored in the buffer specified in the `Table of Results`; for DTMF, the digit collected is stored in the DIGITS buffer. The LISTEN cell also indicates in the INPUT METHOD buffer (from the `Method of Input Detected` parameter) whether the response is DTMF (a value of 1) or speech (a value of 0). The application can access this buffer to determine which branch the call will take out of the cell.

Control mode (which is always speech) allows the caller to control the playing of a prompt. By pressing the DTMF keys specified in the Default cell, the caller can perform functions such as PLAY speed-up and PLAY slow-down, or abort the action of a cell. The `Method of Input Detected` parameter will always be set to speech (0) when the call flow exits the LISTEN cell from the Control mode.

> ***Note:*** All DTMF keys are defined in the Default cell. These values are passed to the LISTEN cell.

Formatting returned results

An application can return ASR-specific information formatted by one of two methods. An ASR vendor-dependent method can automatically format the information, or Symposium OPEN IVR-specific features can be employed to provide customized formatting.

The following formatting options are available:

- FULL — returns all of the information reported
- STRING — returns the text of recognized information
- TAGS — returns a list of specific key words or phrases from the recognized utterance
- INDEX — returns a table offset which indicates a unique ID directing the application to the recognized utterance

- TIME/DATE — returns a standard structure containing the date or time information, or both, formatted properly, regardless of the manner in which it was spoken

  Note: Not all vendors support all formats. See your vendor's documentation for a list of those available. If a format is specified which the vendor does not support, the AP software will set the EXCEPTION STATUS buffer to 1000.

Directing rejected responses

A rejected response is not necessarily an error and, therefore, requires a unique response from the ASR application. A rejection is a recognition result created when an application analyzes an utterance and does not find a match in the associated vocabulary. To accommodate this condition, the LISTEN cell has a REJECTION branch to direct the call flow appropriately.

Reporting exceptions

The LISTEN cell includes a status buffer on the parameter page to report the following error conditions that can occur during the recognition attempt:

- response too quick
- response too short
- response too loud
- response too soft
- format not supported

The system console stores this information in a global buffer, EXCEPTION STATUS. The application can use this information to direct the call flow if it is affected by the response to the various error conditions.

Note: If the application does not detect speech, or if the caller speaks more than the time allotted, a time-out condition results.

Auditing ASR activity

ASR-specific information can be gathered and saved with either an ASR vendor-dependent method or OPEN IVR-specific cell auditing techniques. Either the vendor's documentation, or Chapter 5 of the *System Administration Guide*, "Creating Reports," provides more information.

Sample call flows

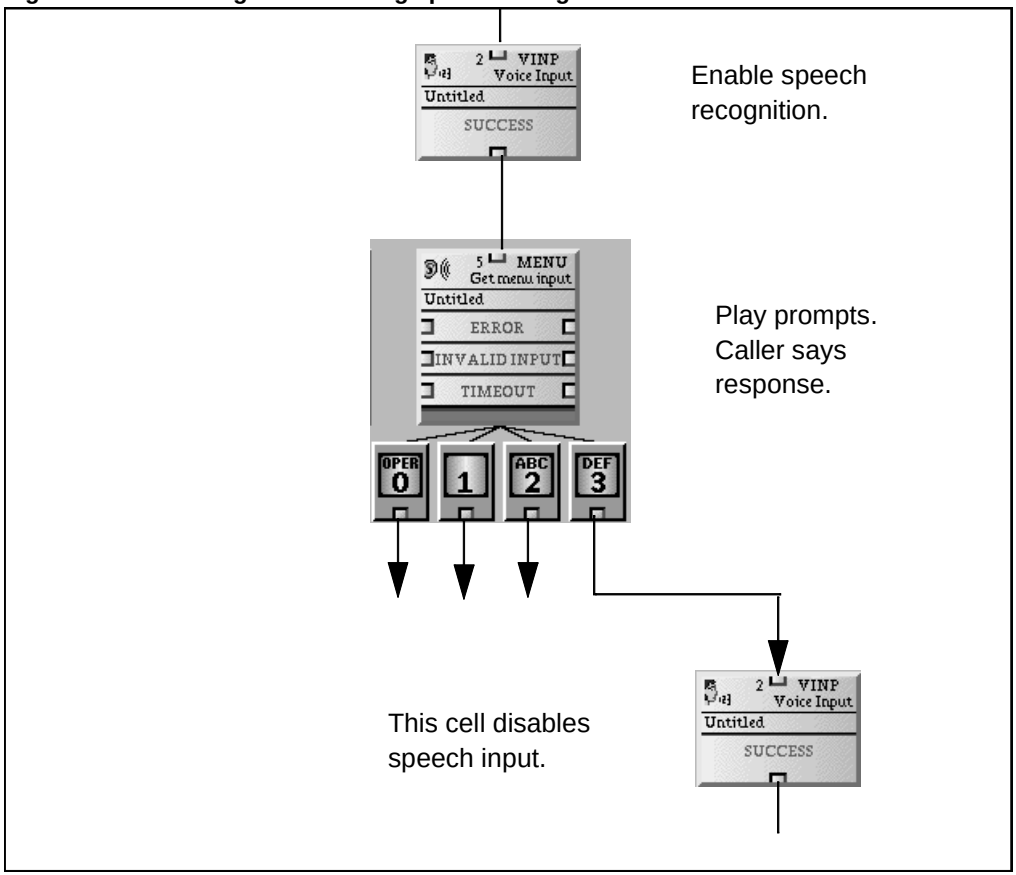
This section shows a few simple techniques you may want to use in your ASR call flow, including the following:

- turning speech recognition on and off
- changing the language/prompts on the fly
- changing the subvocabulary
- branching on Rejection versus Error
- branching to DTMF or speech input
- caller selects the language

Turning speech recognition on and off

The VINP cell can be placed anywhere in your call flow to enable or disable speech recognition. The first VINP cell enables speech recognition. The second VINP cell appearing in the call flow disables speech input if the caller selects a response equivalent to the fourth option (3) on the MENU cell.

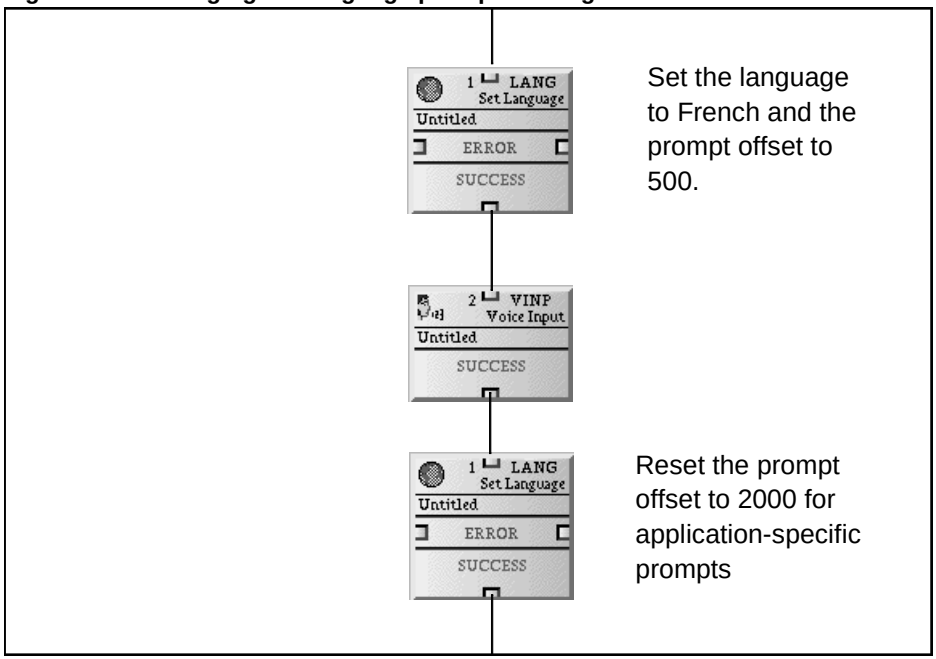
Figure 10-5: Enabling and disabling speech recognition



Changing the language/prompts during the call

This call flow changes the prompt offset in the second LANG cell.

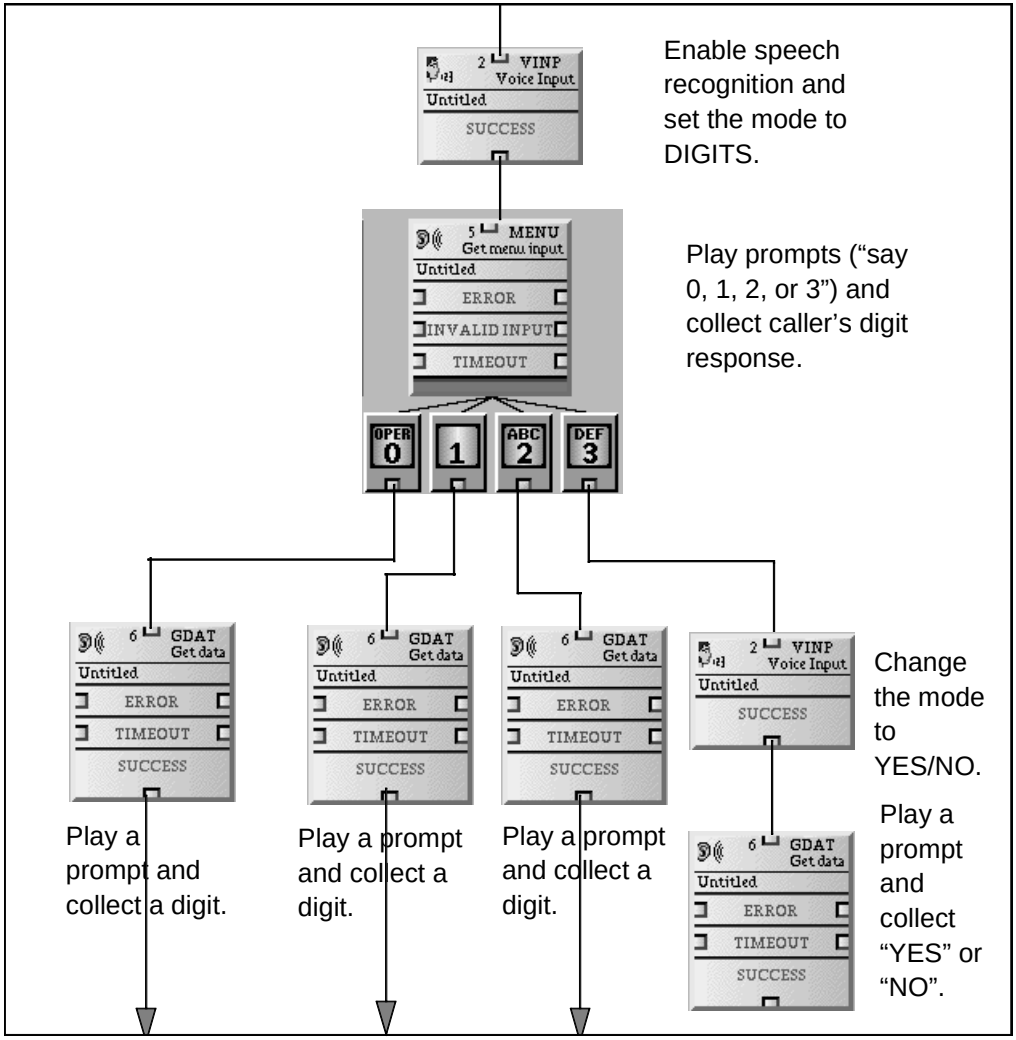
Figure 10-6: Changing the language/prompts during the call



Changing the subvocabulary

A different subvocabulary can be selected by simply inserting another VINP cell.

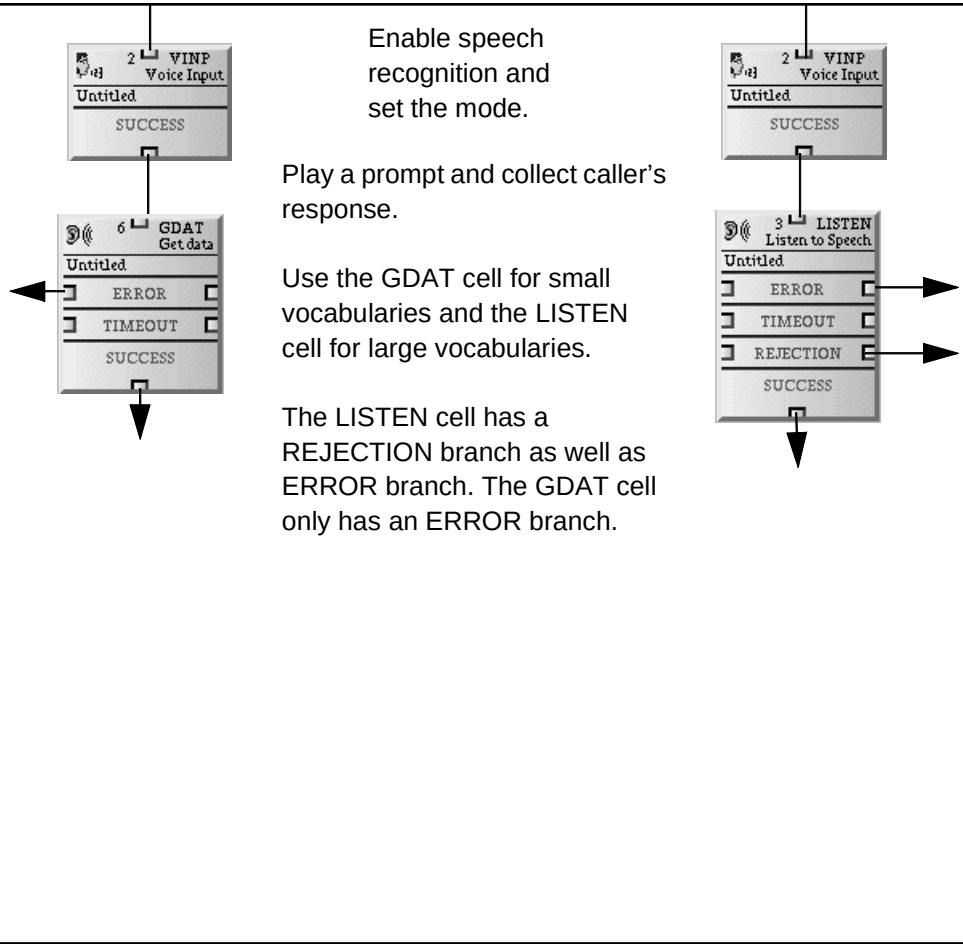
Figure 10-7: Changing the subvocabulary (mode)



Branching on Rejection versus Error

Whereas the GDAT only allows SUCCESS or ERROR, the LISTEN cell provides greater opportunity to reject a recognition attempt.

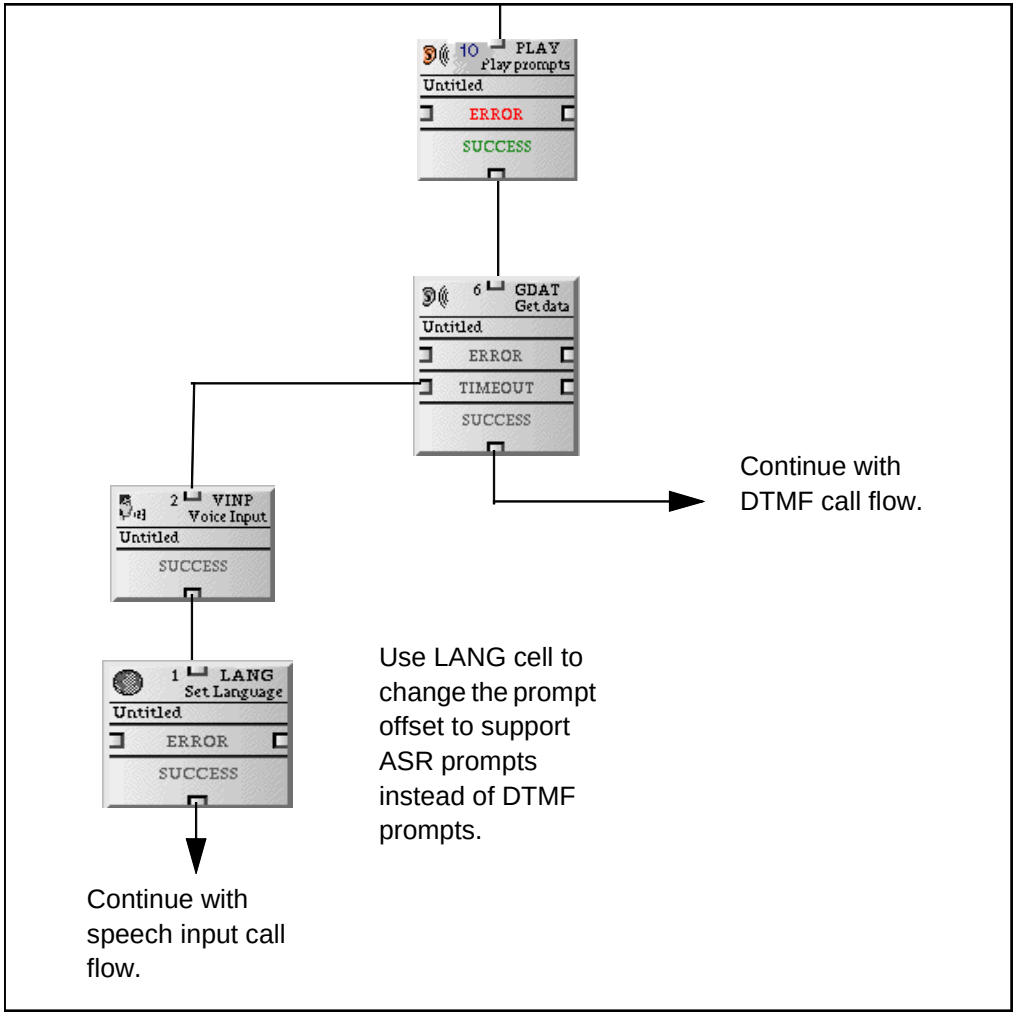
Figure 10-8: Branching on Error or Rejection



Branching to DTMF or speech input

In some applications, you may want to allow the user to use either DTMF or speech input. In this call flow, the INTERDIGIT TIME-OUT is set to 2 seconds with TIME RETRY = 0 for the GDAT cell. If the user does not enter two digits within 2 seconds, the call takes the ERROR branch to enable speech recognition.

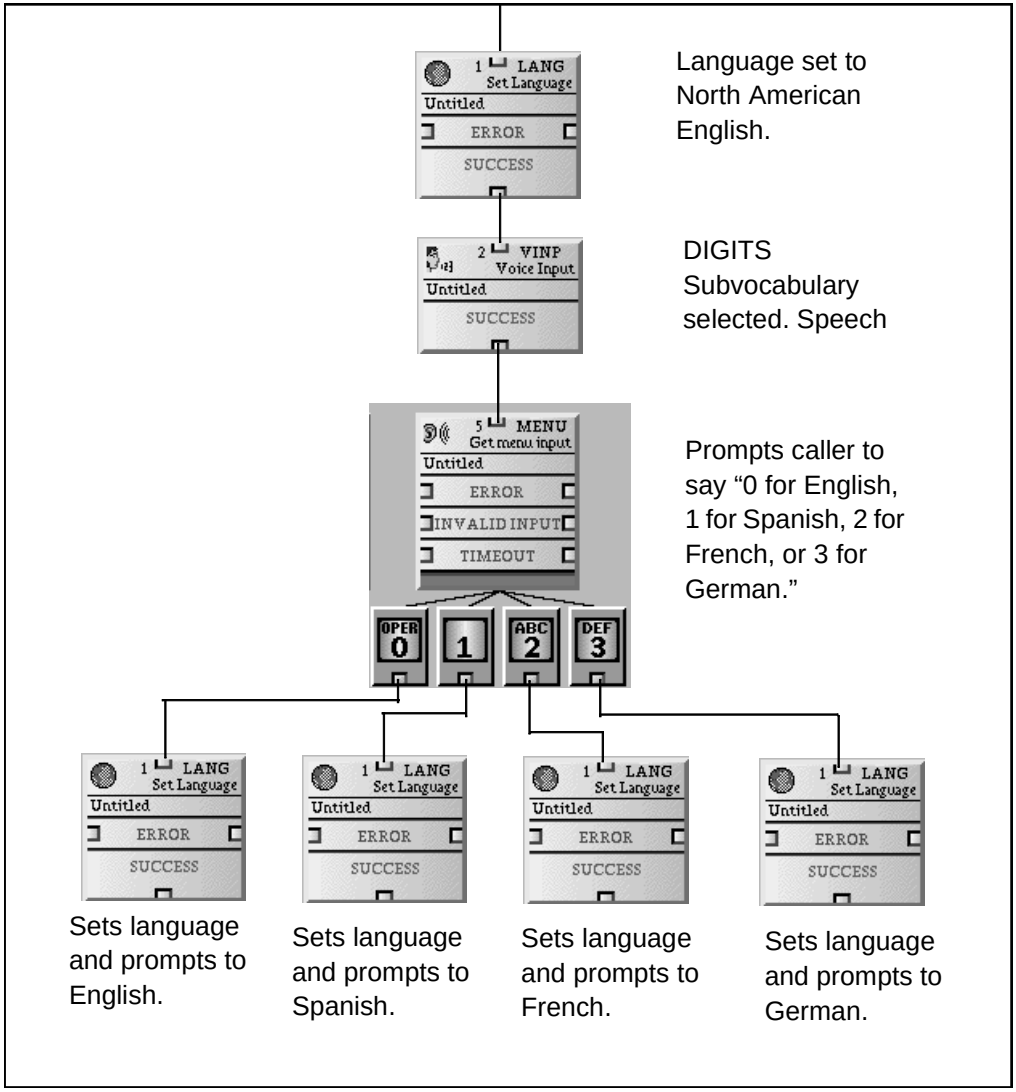
Figure 10-9: Branching to DTMF or Speech Recognition



Caller selects the language

You may want to allow the caller to select the language to be used. This call flow allows the caller to select from several languages.

Figure 10-10: Caller Selects the Language



Creating a simple application

The call flow shown in Figures 10-11 and 10-12 is the start of a simple application that accepts speech input. Notice that the call flow

- sets the language with the LANG cell before any VINP cell
- enables speech recognition and sets the mode (subvocabulary) with the VINP cell
- changes the language with the LANG cell when necessary
- changes the subvocabulary on the fly

Figure 10-11: Sample application

Initializes the application resources.

Answers the call.

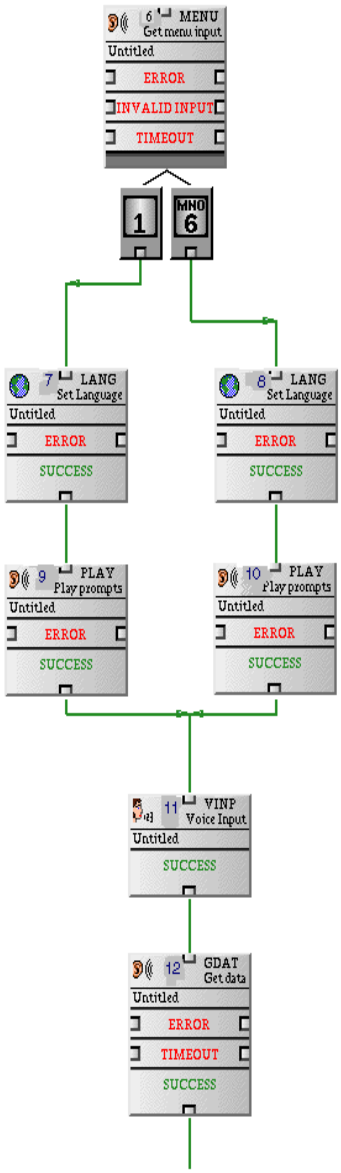
Sets the language to North-American English/Spanish.

Plays the prompt: “Welcome to Zodiac Communications.”

Plays the prompt: “If you speak English say ‘YES’. Hables espanol, ‘SI’.”

Enables speech input and selects the unique vocabulary “Bilingual yes.”

Figure 10-12: Sample application (continued)



Retrieves the hexadecimal value associated with the recognized speech input: “YES” = 0x1. “SI” = 0x6. Although the MENU cell retrieves only a single value, it allows alternative branches.

Sets the language to English.

Sets the language to Spanish.

Plays the prompt: “For sales, say ‘ONE’. For service, say ‘TWO’.”

Plays the prompt: “Para vendes, hables ‘UNO’. Para servico, hables ‘DOS’.”

Selects to use Common Vocabularies, and specifies the “Digits mode.

Retrieves the speech input and continues processing the remaining call flow.

Testing your ASR application

An important part of developing a reliable ASR application is testing it to see if the hardware and software function properly for achieving your intended purpose. Testing in-house and in the user's environment can be useful to eliminate unforeseen problems.

Speech recognition is subject to errors caused by differences in speech patterns between individuals as well as spurious noise generated in the caller's environment or the PSTN. Errors may include the following:

substitution error	The wrong word is recognized, such as "two" when the caller said "eight." This error can be corrected by prompting the caller to confirm the input.
rejection error	A valid utterance could not be detected.
spurious response error	An extraneous noise (for example, a cough) is recognized as a word in the vocabulary. This error can be corrected by prompting the caller to confirm the input.
soft utterance error	The caller does not speak loud enough to overcome a signal-to-noise rejection (SNR).
gap rejection error	The caller speaks before the speech recognizer is ready to accept input.

You should identify the type of callers who will use your application and the environments from which calls will be made. Callers may include those who speak clearly and those who have dialects and accents. Novice callers will perform differently than experienced callers.

The environment from which the call is made can also vary. The PSTN will introduce different levels of noise depending on whether the call is local or transcontinental. A private office will most likely be quieter than a construction site.

To test your application, follow these simple steps.

1. Select a group of people who are representative of your caller population.
2. Write a script for each caller to speak. The script should include the words to be tested for accuracy.

3 Each tester should call and speak the words listed in the script, preferably a number of times and from the expected environments.

The test results should evaluate the number of rejections, substitutions, and gaps encountered. Also, you will need to know if the ASR resources or application take too long to respond to the caller's speech input, and if errors are handled successfully. Your application will need to compensate for times when the caller makes a speech input error, as well as when the speech recognizer does not recognize the spoken word.

Note: With large vocabularies, you may be able to "tune" recognition performance. This is vendor-specific.

Chapter 11: Troubleshooting

While running your ASR applications, you may encounter errors. This chapter discusses how to resolve typical problems that may occur in a voice processing system with an installed ASR option. It is divided into Common errors and Testing your ASR setup (with the NTTEST program).

Common errors

Here are some common error situations you may encounter during your troubleshooting:

Error branch always taken for GDAT or MENU cell

Check that a VINP cell precedes the problem cell and that voice input is enabled. If this is already the case, verify that a free voice recognizer is available.

"Abort Play On Input" parameter does not work even though cell parameter is set to YES.

With voice input, this cell parameter has no effect unless Cut-Thru ASR is enabled.

Overdialing is not allowed even though the cell parameter is set to YES.

This has no effect when ASR is enabled.

Play a prompt and then you hear a beep sound.

The recognizer is now available.

Only one digit is being recognized in a GDAT cell.

This may happen for discrete vocabularies running on VCS/Antares if beep is disabled. If the application requires more than one digit to be recognized, then enable beep or use a series of GDAT cells in sequence.

Testing your ASR setup

The NTTEST software is installed during the system installation, and is resident on the system. It includes diagnostics for testing various applications on your system, including your ASR configuration. For further information about NTTEST, refer to Chapter 24, "Verification test (NTTEST)", in the *Installation, Upgrade, and Maintenance Guide*.

It is assumed that those testing the ASR applications are familiar with standard system administration procedures, the details of which are documented in the *System Administration Guide*.

1 Load/run NTTEST and its applications

Run the script `nttest_str`. This loads NTTEST and all its sub applications.

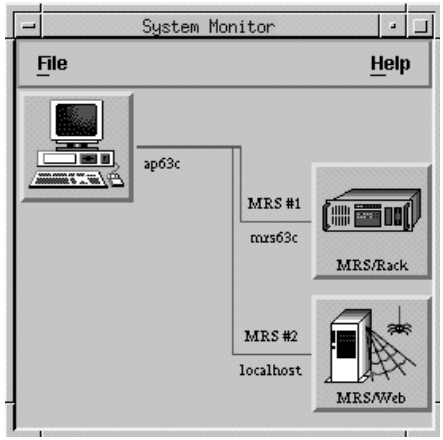
2 Verify the channel alignment

Note: Your system must have been configured already. It should be set to Ring trip, Input, and LoopStart Initialization type as the preferred configuration. Any telephone company changes required would be done through editing of the trunk type files.

a Access the System Administration pull-down menu by pointing and clicking mouse button 1 on the System Administration icon (MRS box with arrows) on the control panel.

b Select the System monitor menu option which will open the System Monitor administration menu. When the outline of a box shows up, move the box to a space on the desktop where you can view it. Select mouse button 1 to show the system monitor.

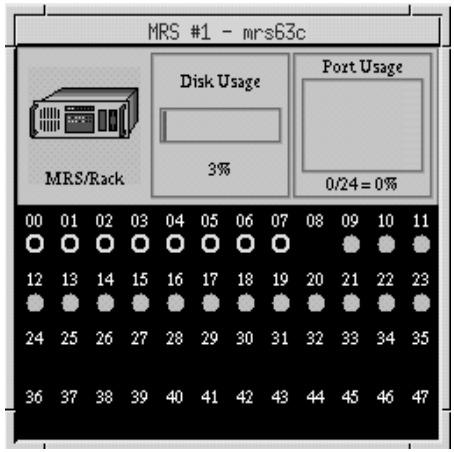
Figure 11-1: System monitor



Note: For more information on how the System Monitor works, please refer to the Release 4.0 *Symposium OPEN IVR System Administration Guide*.

c Select the MRS icon to display the system status window (Figure 11-2). This window contains information on the various channels status.

Figure 11-2: Status Information



Gray Ring means outgoing. Gray circle means incoming on the channel monitor. When the application is loaded, channels assigned, and the application started, the gray circle will change to a yellow ring.

3 Verify/modify the channel alignment

Once the test application is loaded, you can assign channels to the application and enter all incoming channels.

If the channels assigned to the test do not match those currently configured on your system (as seen on your system monitor), make the appropriate adjustments. Else continue to Step 5.

To set channels, follow these steps.

a In the Application Management window, press F3.

b Enter the channel range and press <Enter>.

The channels you enter will be listed in the channel range column of the Application Management screen.

4 Test the ASR setup

To test the ASR setup, do the following

a Place a call to a number that corresponds to a channel on the MRS system.

The system monitor MRS #1 window will display a solid yellow circle to indicate that the call went through on that channel.

b Follow the prompts as they guide you through the testing of the application. Speak clearly and distinctly into the phone when requested to do so by the prompts. The accuracy of the speech recognition is based on how clearly your voice is heard by the system.

Note: If this test fails, possible reasons for the error conditions could include a defective phone, or a voice speaking too loudly is causing distortion.

5 Stop the test application

To stop the test application, run the `NTTEST_stp` script. This will unload NTTEST and all the sub applications.

6 Exit Application Management

a To exit Application Management, press <F4> to access the Application Management main menu.

b Select `Exit`. The System Application management window closes.

Check the results

All completions of tests are recorded in the `event.log` file in the directory `/u/nortel/log.d`.

Appendix A: Speech recognition card configuration

This appendix shows the layout, switch settings, and various configuration requirements for the following boards:

- the Antares 2000/50 card
- the VR/160 Speech Recognition card

  Note: The VR/160 board is for PEB-based systems only.

It also presents the configuration rules for the PEB and SCbus environments, with graphical illustrations for each.

Bus configuration rules

There are two kinds of bus configurations supported in Symposium OPEN IVR—PEB and SCbus. The following sections present the connectivity rules for each, along with some supporting graphical examples.

PEB bus connectivity rules

The PCM Expansion Bus (PEB) is a digital voice bus for sending voice across different voice processing cards and components in the same PC. It is an open platform, yet has strict rules regarding card positioning and termination. Cards on any one PEB must have a contiguous slot allocation (e.g. a card on PEB 2 must not be inserted in a slot between the first card and last card of PEB 1). The following are PEB connectivity rules.

Connecting the ends

For all configurations with more than one PEB card in the system, one end of the PEB must always be connected to either a high density card(s) or a telco interface card(s).

For low density configurations, the opposite end of the PEB must always be connected to a voice processing card(s).

Ordering and termination

Option cards must be installed between the telco interface card(s) and the voice processing card(s) for low density configurations. For high density configurations using option card(s), an option card should terminate the PEB.

The first and the last board on the PEB must be terminated, while other boards should not be terminated.

In cases where a high density card is the only card in the system, such as the D/240SC-T1 or the D/41ESC, a PEB terminator should still be installed in the RES position on the card.

Interrupt termination

Interrupt terminator JP7 must only be installed on the D/121B or D/81A card furthest from the CPU.

In a high density configuration, interrupt terminator JP7 should be installed on the voice recognition card furthest from the CPU.

Handling multiple LSI cards

If more than one LSI/120 or LSI/80 interface card is installed on the same PEB cable, only the first card (time slots 00-11 for LSI/120 or 00-07 for LSI/80) should be clock master at the end of the PEB. On that card SW1-3 must be OFF. All other LSI/120 or LSI/80 cards on the same PEB must have SW1-3 in the ON position.

Handling the 60-port E1 card

Two PEBs must be used with the 60 port E1 card. Both PEBs attach to the E1 card, and extend to the left and right side of the card. A D/320SC voice processing card should be connected on the end of each PEB. Option cards are placed between the E1 card and each D/320SC card. See Figure A-4.

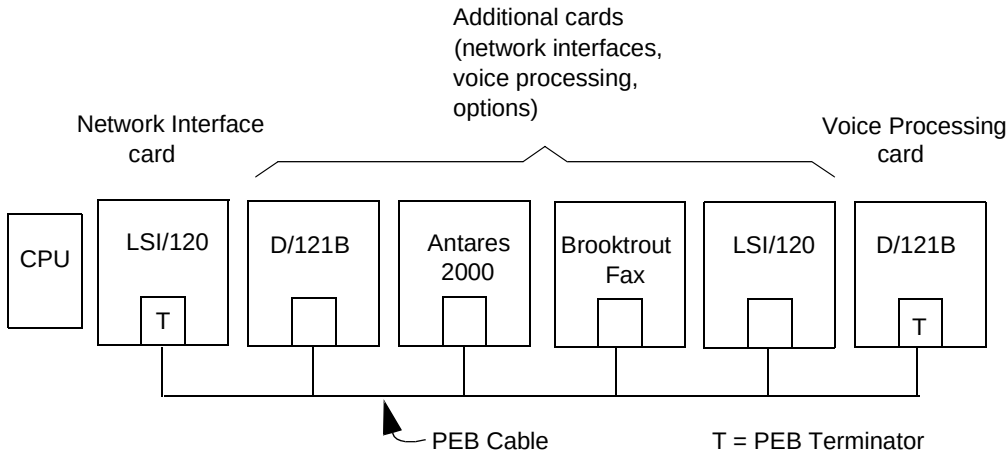
PEB connectivity examples

The figures that are included in this section show the boards that must be terminated on the PEB. Terminators are identified as “T” for an external terminator that must be plugged into a socket on the card, and “t” for an internal terminator that is built into the card. The only cards that have an internal terminator are the 30 and 60 port E1 cards. As a result, they do not require external PEB terminators to be installed. The internal terminator is installed by the card manufacturer, and cannot be removed.

Position of option cards

The PEB can support up to two 12-channel loopstart network interface cards. The option cards (e.g. fax, voice recognition) whose resources are available to all channels on the PEB should be installed between the end cards, as shown in the figure below. The order of the option cards is not important.

Figure A-1: Multiple cards on a PEB



Additional PEB connectivity examples

The following figures graphically illustrate PEB cabling rules.

Figure A-2: Cabling when using the D/240SC-T1 (terminate in res position) card

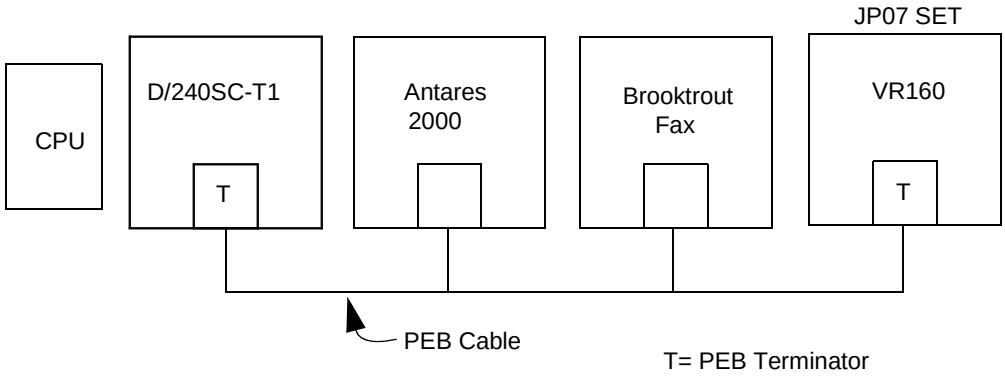


Figure A-3: Cabling when using the 30 port E1 card

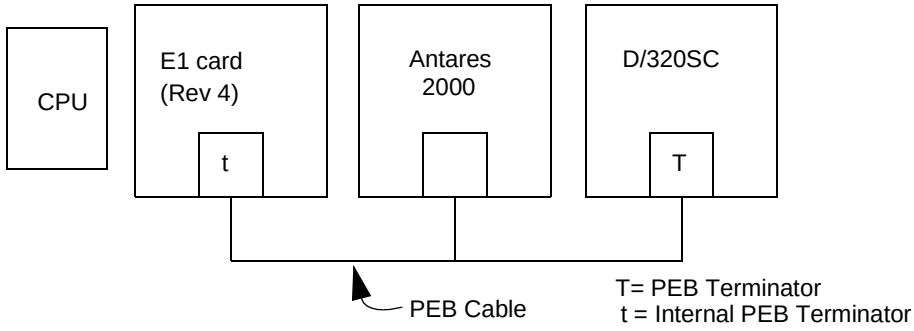


Figure A-4: Cabling when using a 60 port E1 card

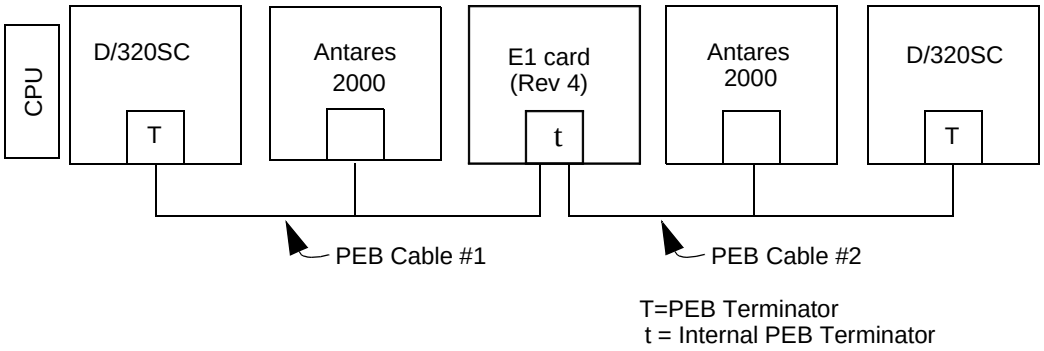


Figure A-5: Cabling when using a single loopstart card

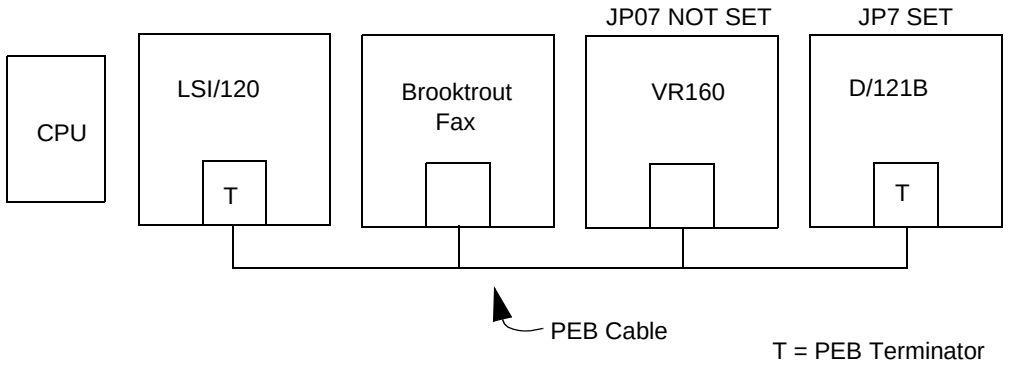


Figure A-6: Cabling when using a single D/41ESC (terminate in RES position) card

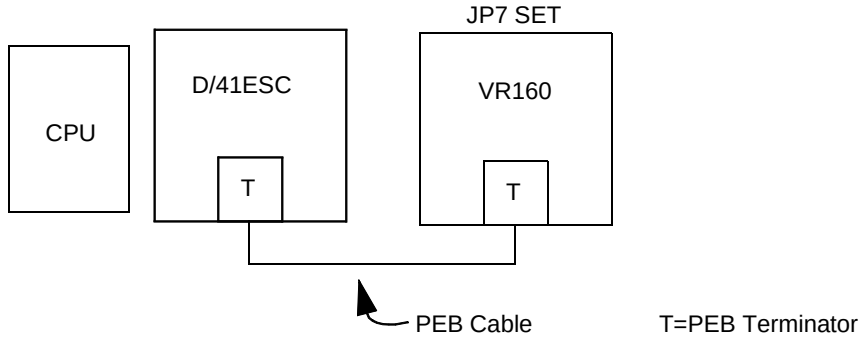
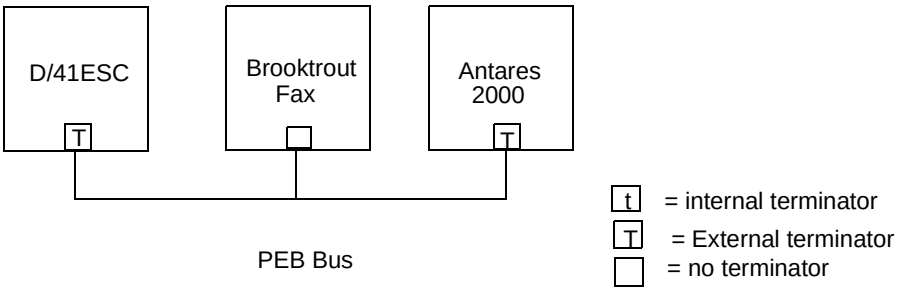


Figure A-7: PEB loopstart cabling with the Antares card



SCbus connectivity rules

The SC (Serial Computing) Bus is a serial time division multiplexed bus for carrying information between hardware devices in a signal processing mode. The SCbus can support up to 1024 bidirectional timeslots in a PC implementation, or up to 2048 timeslots in a backplane implementation. The SCbus uses 16 synchronous data lines for carrying data, and a dedicated message channel for carrying signalling information and messages between devices.

Basic SCbus rules

The following are SCbus connectivity rules:

- Termination is not used on SCbus cards.
- The SCbus cable is identical to the PEB cable.
- Only one SC Cable must be used with the 60 port E1 card. The SC cable attaches to the E1 card, and extend to the left and right side of the card. A D/320SC voice processing card should be connected on the end of each SC cable. Option cards are placed between the E1 card and each D/320SC card.

SCbus connectivity examples

The following figures graphically illustrate SCbus cabling rules.

Figure A-8: Cabling when using the D/240SC-T1 card

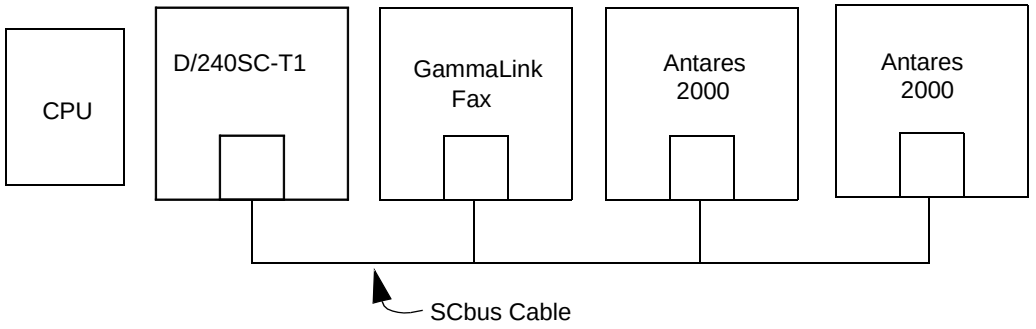


Figure A-9: Cabling when using the 30 port E1 card

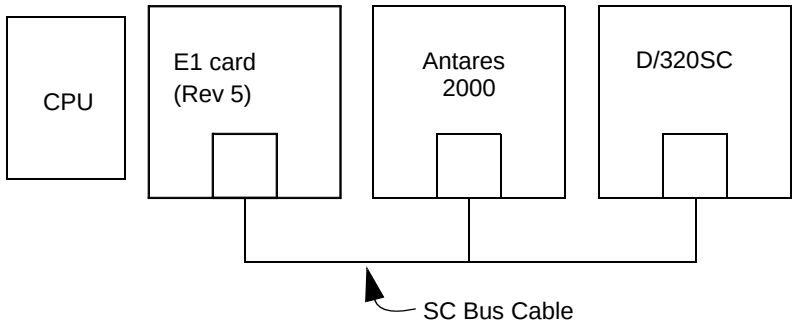


Figure A-10: Cabling when using a 60 port E1 card

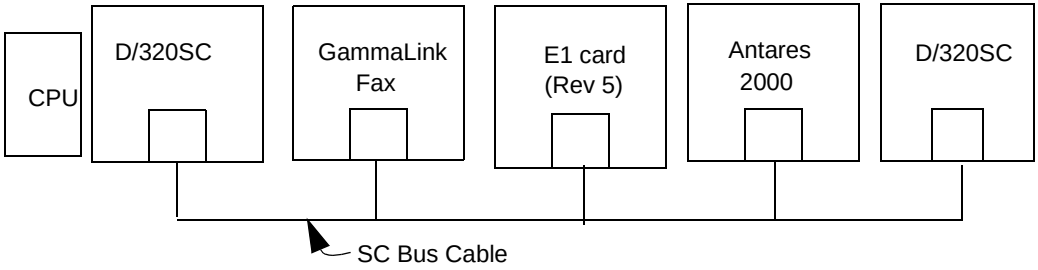


Figure A-11: SCbus loopstart cabling with the Antares card

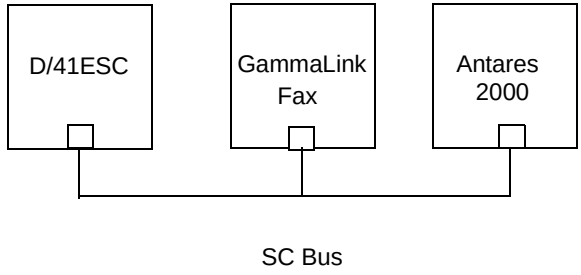
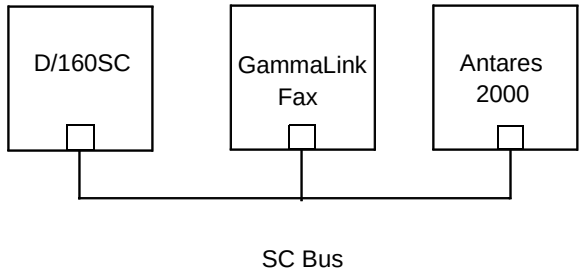


Figure A-12: Cabling when using the D/160 SC card



Supported speech recognition cards

This section presents information about the Antares 2000/50 and VR/160 cards.

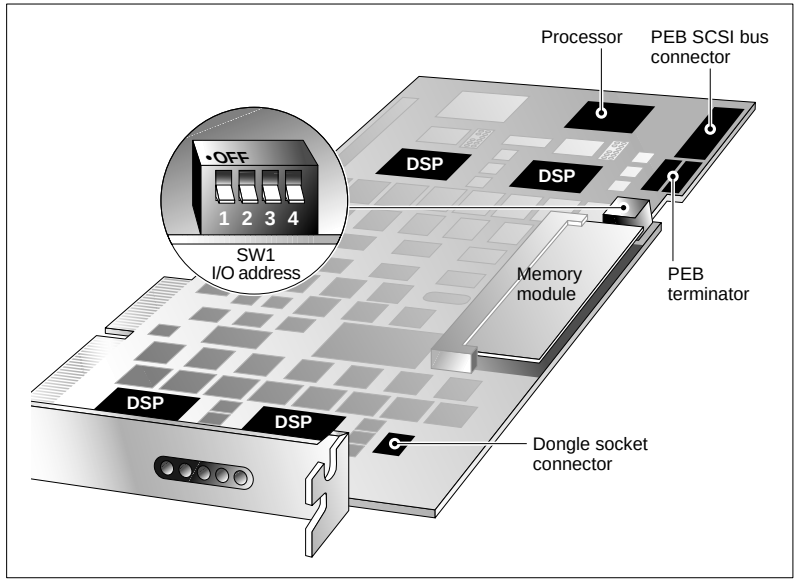
Antares 2000/50 speech recognition card

The Antares card is a general-purpose DSP platform for deployment of various speech technologies. It is used by Symposium OPEN IVR 4.0 systems for both speech recognition and TTS. The personality of the card is determined by the board configuration via MRS software and specific algorithms downloaded onto the board at boot time. All technologies are licensed via a security key (dongle) located in the upper right corner of the board, and a License File loaded on the MRS as a part of the MRS installation process. The dongle contains information on the number of enabled channels and the language to use.

> ***Note:*** A red status LED indicates a fatal error. This can be caused by a missing security key or a board crash.

Types of cards. There are two types of Antares 2000 cards available—33 Mhz and 50 Mhz. Only the 50 Mhz card is supported by Symposium 4.0. (You can tell one type of board from the other by looking at the name on the face of each of the DSP chips.) 50 Mhz Antares cards have only one PEB Terminator socket, while 33 Mhz Antares cards have dual PEB terminator sockets.

Figure A-13: Antares 2000/50 card



Configuration issues

Set switch SW1 to uniquely identify the Antares card in the system. SW1 sets the board I/O address as shown in Table A-1. The table also lists available I/O addresses for installation of Antares cards in the system.

Table A-1: Antares card I/O address SW1 settings

	I/O address	1	2	3	4
Card 1	210–217h	on	off	on	on
Card 2	218–21Fh	off	off	on	on
Card 3	220–227h	on	on	off	on
Card 4	228–22Fh	off	on	off	on

Available bus modes. The Antares card may operate in PEB or SCbus mode, subject to technology deployed on the Antares card. A PEB Terminator is only necessary when the card is operating in the PEB mode. No terminators are necessary for the SCbus mode of operation.

PEB termination. When running in PEB mode, PEB terminators must be installed at the end of the PEB bus to ensure proper electrical characteristics of the PEB bus. Unless otherwise specified, install PEB terminators in the lower termination socket as a resource card.

IRQ selection. IRQ selection is performed during installation of the Antares Device Driver and, on most platforms, should be set to 9. On an MRS/Tower or MRS/Rack platform, the IRQ is set to 12. Since one IRQ line is shared by multiple Antares cards, be careful to avoid IRQ conflicts with other cards.

Antares dongles. Antares dongles are small (approximately 1/2 inch) black devices which attach to the Antares cards. Up-to-date dongles are needed on the Antares cards to support the current speech recognition technology.

> ***Note:*** Antares dongles used in OPEN IVR 2.01 and OPEN IVR 2.5 can not be reused in SOIVR 4.0.

VR/160 speech recognition card

The VR/160 speech recognition card installs in a 16-bit (ISA) expansion slot. The VR/160 card is comprised of a Voice Recognition Platform (VRP) baseboard and one to four Voice Recognition card (VRM/40) daughterboards for discrete word recognition (or VRM/2C daughterboards for continuous word recognition). Up to four VRM/40 or VRM/2C boards can be fitted on the VRP. Each VRM/40 provides 4 discrete speech recognition ports. Each VRM/2C provides 2 continuous speech recognition ports.

Figure A-14: VCS VR/160 card

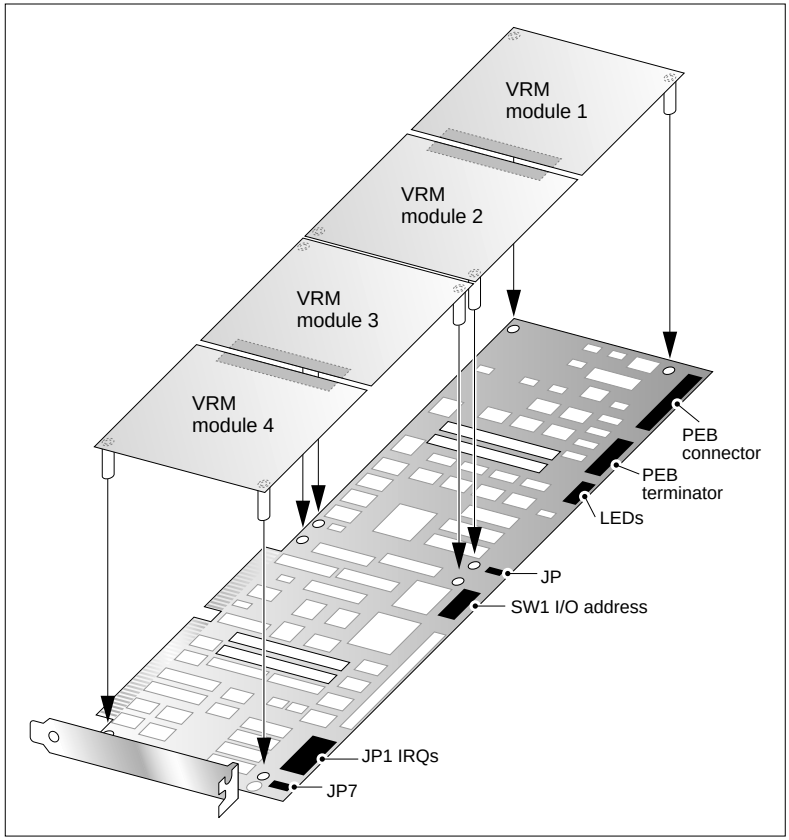


Table 11-1: SW1 base I/O addresses

Card #	I/O address	1	2	3	4	5	6	7	8	Memory range
Card 1	200–203h	off	on	on	on	on	on	on	off	D8000–D9FFF
Card 2	204–207h	off	on	on	on	on	on	on	off	DA000–DBFFF

Table 11-2: VRM cards base I/O addresses switch settings

VRM #	I/O address	1	2	3	4	5	6	7	8
1	8000h	on	on	on	on	on	on	on	off
2	8100h	off	on	on	on	on	on	on	off
3	8200h	on	off	on	on	on	on	on	off
4	8300h	off	off	on	on	on	on	on	off

Appendix B: Sample application: Voice-Activated Dialing

There are many possible applications for Automatic Speech Recognition. One example is Nortel's Voice-Activated Dialing application. Voice-Activated Dialing, or VAD, accesses specific numbers from a database on the application processor without actually dialing the number, based on caller responses.

With VAD, a caller responds to prompts for a specific action (for example, "Get Service" followed by a name ("George Melville"). If there is a match in the associated database, the application will outdial the phone number corresponding to the specified name.

This appendix provides a brief description of the VAD application.

> ***Note:*** To implement a VAD application, or for assistance in developing other customized applications, contact your Nortel sales representative.

Overview

Voice-Activated Dialing provides several interesting features for ASR developers and users:

- hands-free dialing
- safety and convenience for cellular telephone users
- name dialing for speed dialing
- digit dialing through speech input
- multilingual support
- OPEN IVR Enhanced Services Platform support

Hands-free dialing

VAD provides service subscribers with the option to dial their telephones via spoken commands, as an alternative to DTMF keypads or rotary dialers. Subscribers can access the hands-free VAD service from a wired telephone, a remote wired telephone, or a cellular mobile telephone. VAD enables both name dialing and digit dialing.

Safety and convenience for cellular telephone users

As the mobile telephone market grows, the VAD service provides a safety feature for the subscriber. Many countries, such as Brazil and Australia, have laws banning the use of a hand-held telephone while driving an automobile.

The convenience of hands-free dialing for the subscriber extends into the office and home. Commonly called telephone numbers or extensions can be dialed automatically by speaking the name of the desired party. A more intuitive and natural form of interfacing with the telephone, spoken commands provide the additional benefit of time and effort saved in looking up and dialing telephone numbers.

Name Dialing for speed dialing

By using the Name Dialing feature of VAD, the subscriber creates custom calling directories which allow the convenience of remembering names to call, rather than remembering the numerical sequence in traditional speed dial options and memory dialing products. To make the call, the subscriber speaks such phrases as “call home” or “call office”—names in the personal directory—and has the associated telephone number automatically dialed.

Digit dialing through speech input

VAD supports digit dialing which allows the subscriber to dial telephone numbers by speaking the digits of the telephone number to be called. As with name dialing, this hands-free operation accesses the called party with a minimum of interruption to other ongoing tasks.

Multilingual support

VAD combines sophisticated linguistics with the latest voice, microprocessor, and signal-processing technologies to deliver multilingual processing. With support for over 39 language vocabularies, which can be combined in a single service application to reach a multilingual market, VAD enables the service provider to do the following:

- Utilize multi-country processing.
- Unify call processing applications in cities/countries where multiple language preferences exist.
- Differentiate services from standard single vocabulary or DTMF offerings.

Symposium OPEN IVR Enhanced Services Platform support

VAD is one of a family of advanced integrated options of the Symposium OPEN IVR Enhanced Services Platform (ESP). With fully integrated audiotext, Automatic Speech Recognition, database inquiry/update, fax, interactive voice response, Text-to-Speech synthesis, transaction processing, voice mail, and other computer-telephony integration and telecommunications features on a single platform, OPEN IVR provides developers with the sophisticated capabilities to develop and deliver the flexible enhanced services in demand by subscribers.

How VAD works

The database may contain up to 20 different names and associated numbers per subscriber. You must add the names and associated numbers to the database prior to using this feature.

VAD and the associated database additions are accomplished using a combination of speaker-independent and speaker-dependent voice recognition. The speaker-independent portion contains vocabularies with the words necessary either to perform the actual outdial (CALL) or to train the application processor (ADD). The speaker-dependent portion is used to retrieve the names the user requests the system to call. For further information on the use of VAD, contact your Nortel sales representative.

VAD vocabulary

The vocabulary necessary for VAD contains five different subvocabularies:

- discrete digits
- discrete yes/no
- speaker-independent words for using the VAD option: CALL, DIAL, PROGRAM, SERVICE, HELP, and CLEAR
- speaker-independent words for training VAD: ADD, CHANGE, VERIFY, HELP, and CLEAR
- speaker-dependent algorithm for returning the 25 short integers representing what was said by the speaker

  Note: In order to use speaker-dependent speech recognition, you must load a special vocabulary that will enable you to generate responses to speech utterances. The speaker-dependent vocabulary must be numbered 30, or your application will not work.

For further information about this application, contact your Nortel sales representative.

Glossary

This glossary provides definitions of many of the terms as used in this guide. Some of these terms may have additional meanings not described here.

μ-law

Also called mu-law. A form of Pulse Code Modulation (PCM), alternative to A-law. μ-law is used for the B channel of T1 streams, and is the commonly used North American standard.

A-law

A form of Pulse Code Modulation (PCM), in which the code word maps nonlinearly to the signal value. It is the standard compression algorithm used in digital communications systems of the European digital hierarchy. A-law code words are 8 bits wide. A-law is used for the B channel in ISDN.

ADSI

Analog Display Services Interface. The Bellcore standard defining the protocol used for the flow of information between a piece of telephone equipment (such as a switch, server, or voice mail) and a subscriber's telephone, PC, data terminal, or other device with a screen.

agent

A person whose primary role is to handle customer calls that are transferred from a queue within a call center.

Analog Display Services Interface

See ADSI.

AP

Application Processor. A computer or workstation running the AP software in a distributed configuration. Symposium OPEN IVR combines one or more Multimedia Resource Servers (MRSs) with a general-purpose Application Processor (AP) to provide a versatile application development and run-time environment. The AP provides the environment for developing, managing, and controlling the IVR applications.

AP software

Nortel's premiere voice application development and management software package that runs on the Application Processor (AP). Application development capabilities are a licensed feature of AP software, through IVR Developer software.

Application Programming Interface. Software libraries that provide a standard access to services provided by a software package.

application

1 In Symposium OPEN IVR, a customized program that controls activity on one or more telephone trunks connected to an MRS voice system.

2 On a host computer, any type of program that carries out a task.

application developer

A person who creates Symposium OPEN IVR applications.

Application Editor

A utility used to graphically create or edit interactive voice response applications.

application processor

See AP.

ASR

See Automatic Speech Recognition.

Automatic Speech Recognition

The ability of a machine to understand spoken input.

barge-in

See voice cut-thru.

branch

A pathway from one cell in an application to the next cell.

buffers

A part of computer memory used to store information from one cell and pass it to another cell.

call flow

A diagram of a Symposium OPEN IVR application.

caller

A person whose phone call is received or originated by a Symposium OPEN IVR application.

cell

The basic element of an application. Each cell causes some action to be performed—for example, playing a prompt to a caller. Each cell has a set of branches to other cells.

common vocabularies

Subvocabularies that are grouped together because of common word content (such as DIGITS and YES/NO subvocabularies).

continuous recognition

The ability to recognize speech input without awareness of explicit word end points.

cut-thru

See voice cut-thru.

discrete recognition

The ability to recognize speech input based on a small interval of silence between words.

DTMF

Dual Tone Multi-Frequency. Touchtone (push button) dialing. DTMF is used to encode digits over analog telephone lines. Applications can collect information from callers by having them press telephone keys to create DTMF tones. The ASR option can accept both voice and DTMF input.

DTMF only mode

The default data input mode used by a Symposium OPEN IVR application to process caller input.

Dual Tone Multi-Frequency

See DTMF.

EXEC

The cell that executes an OPEN IVR application on the current channel.

falsing

A condition in which certain frequencies in a voice recording are incorrectly interpreted as DTMF tones. In some applications, false DTMF tones may cause the system to perform unwanted activities, such as selecting menu choices, terminating playback, or hanging up prematurely.

gain

The increase in signal power, measured in decibels, when the signal is boosted by an electronic device.

gap rejection error

An error that occurs when the caller speaks before the speech recognizer is ready to accept input.

GDAT

Play Prompts and Get Data. A cell that allows you to play one or more prompts and collect up to 16 digits of input from the caller.

hook-flash

Depressing and releasing the plunger or handset-cradle on a telephone.

index

A subvocabulary.

Information Database Editor

A utility used to create a message or information database, and to edit an information database.

IRQ

Interrupt Requests (also called hardware interrupts). They are a way that a device signals the data bus and the CPU that it needs attention.

IVR

Interactive Voice Response.

IVR Developer

A licensed component of AP software that provides application development tools to graphically create or edit interactive voice response applications.

language

A group of words within a vocabulary that are common to a specific people (for example, English, French, or German). A vocabulary may contain words from only one language or be multilingual with words from two or more languages (for example, North American English/Spanish).

large vocabulary

A vocabulary domain consisting of more than 16 words (for example, corresponding to the equivalent DTMF keys on the telephone keypad).

license file

A file which reflects the various product licenses purchased for your system. Whenever you modify any of the options available on an MRS with Symposium OPEN IVR MRS software 4.0 or greater, you need to load a new license file.

loopstart

A method of signalling on the trunk in which a supervisory signal is given (by taking the phone off the hook). Loopstart seizes the line by bridging the resistance of the tip and ring wires of the telephone line to obtain a dial tone. Loopstart signalling is normally used for single lines or key systems.

maplist

A listing showing the association between vocabulary words and the hexadecimal codes passed to your IVR applications.

mode

Refers to the subvocabulary that is currently active. The VINP cell selects the common or unique (sub)vocabulary. Speech recognition operates in this mode until another VINP cell changes the subvocabulary.

MRS

Multimedia Resource Server. Symposium OPEN IVR combines one or more Multimedia Resource Servers (MRSs) with a general-purpose Application Processor (AP) to provide a versatile application development and/or run-time environment. The MRS provides the telephony, information processing (voice, fax, speech recognition, and text-to-speech) environment.

MRS/AP

A single unit that runs a “folded” configuration; that is, a configuration that includes both the Multimedia Resource Server and the Application Processor. The MRS/AP contains the functionality of the other platforms, but in a single hardware unit.

MRS/Rack

A unit comprising a rack-mountable Application Processor (AP) and a rack-mountable Multimedia Resource Server (MRS). Multiple MRS/Racks can be installed in cabinets and stacked to take up less room.

MRS/Tower

The MRS/Tower platform is comprised of an Application Processor and a Tower Multimedia Resource Server.

Multimedia Resource Server

See MRS.

mu-law

Also called μ-law. A form of Pulse Code Modulation (PCM), alternative to A-law. Mu-law is used for the B channel of T1 streams, and is the commonly used North American standard.

node

A grouping composed of an AP (running Symposium OPEN IVR) connected to one or more MRSs.

parameter

A variable used to define the function of Symposium OPEN IVR cells. You set parameters in the parameter window for each cell (when using the Application Editor), or in the cell window (when using the character-based Application Editor).

PCM

Pulse Code Modulation. A method that uses a sequence of discrete integers as code words to describe a time-varying signal. Each integer code word describes the signal level at a point in time.

PDAT

Play Prompts with Data. A cell that allows you to play prompts to announce the contents of a buffer. The buffer content is read according to the specified type.

PEB

PCM expansion bus. A digital voice bus for sending voice across different voice processing cards and components in the same PC. It is an open platform.

prompt

A voice recording that helps lead a caller through a Symposium OPEN IVR application.

record

1 To store sound on tape or disk for later play back.

2 In a database, a group of related data items (fields) treated as one item.

recognizer

Hardware/software that attempts to interpret caller speech and match it to the currently active vocabulary domain.

rejection error

An error that occurs when speech input does not closely match words in the active subvocabulary.

SCbus

Signal Computing bus—the standard bus for communication within an SCSA node. It is a serial time division multiplexed bus for carrying information between hardware devices in a signal processing mode. SCbus features a hybrid bus architecture consisting of a serial message bus for control and signalling, and a 16-wire TDM data bus.

session

1 A connection to a host computer as defined in the `trs.conf` and `vt100.ctl` files, representing a terminal connection.

2 A connection between two systems for the exchange of user data. Sessions are between logical units (LUs).

small vocabulary

A vocabulary domain consisting of up to 16 words (for example, which can be mapped to the DTMF keypad).

soft utterance error

An error that occurs when the caller does not speak loudly enough to overcome a signal-to-noise rejection (SNR).

speaker verification

A method for determining the identity of the speaker.

speaker-dependent

Having the ability to recognize speech input from individuals who have “trained” the device to match their unique speech patterns.

speaker-independent

Having the ability to recognize speech input from a wide-array of individuals without training.

spurious response error

An error that occurs when an extraneous noise (for example, a cough) is recognized as a word in the vocabulary. This error can be corrected by prompting the caller to confirm the input.

substitution error

An error that occurs when the recognizer classifies the wrong word for the spoken word (for example, substitutes “one” when “nine” is spoken).

subvocabulary

A subset of a vocabulary that contains a range of templates. A subvocabulary of the downloaded vocabulary is assigned to each recognizer.

template

A binary pattern representing a word or utterance.

1 An ASCII file used by the TRS process to manage the SNA terminal session.

2 An ASCII file used by the TRS process to manage the VT100 terminal session.

3 A binary pattern representing a word or utterance.

Text-to-speech

Text-to-speech (TTS) is the process of converting text—usually in the form of ASCII files—to speech output. It is used in applications where it is inconvenient or impossible to record a human speaker.

TIFF

Tagged Image File Format. TIFF provides a way of storing and exchanging digital image data. Originally developed by Microsoft Corp., Aldus Corp., and major scanner vendors to help link scanned images with popular desktop publishing applications, it is now used in many different of software applications, ranging from medical imagery to fax modem data transfers. (It does not mean “Took It From a Fotograph”.)

utterance

A speech made by a caller.

VINP cell

An OPEN IVR cell which toggles data input mode between voice input and DTMF only (default) mode.

vocabulary file

A binary file that contains representations (templates) of words or utterances. The vocabulary file is downloaded to the recognizer board prior to enabling Automatic Speech Recognition.

voice cut-thru

Accepts caller speech while a prompt is still playing.

voice input mode

When enabled by the VINP cell, this mode allows the OPEN IVR application to accept both voice and DTMF input.

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